DOCUMENT RESUME

ED 046 693 SE 009 427

AUTHOR	Parsons, Donna L.
TITLE	Idaho, An Outdoor Classroom.
INSTITUTION	Caldwell School District 132, Idaho.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	Sep 68
GRANT	OEG-3-7-70457-4972(056)
NOTE	224p.
AVAILABLE FROM	Donna L. Parsons, Caldwell School District 132, Idaho
EDRS PRICE	EDRS Price MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS	Conservation Education, Ecology, Environment, *Environmental Education, *Field Trips, Natural Resources, *Outdoor Education, *Teaching Guides
IDENTIFIERS	ESEA Title III

ABSTRACT

This field guide for public school teachers pinpoints special areas in Idaho where students can study and learn by direct experience in the outdoors. The guide divides the state into northern, southwestern, and southeastern districts. Environmental study trip guides complete with roadlogs, pictures, and maps of each area develop the three major districts. The guide concludes with a listing of industries, and guided tours of their facilities. This work was prepared under an ESEA Title III contract. [Not available in hardcopy due to marginal legibility of original document.] (BB)

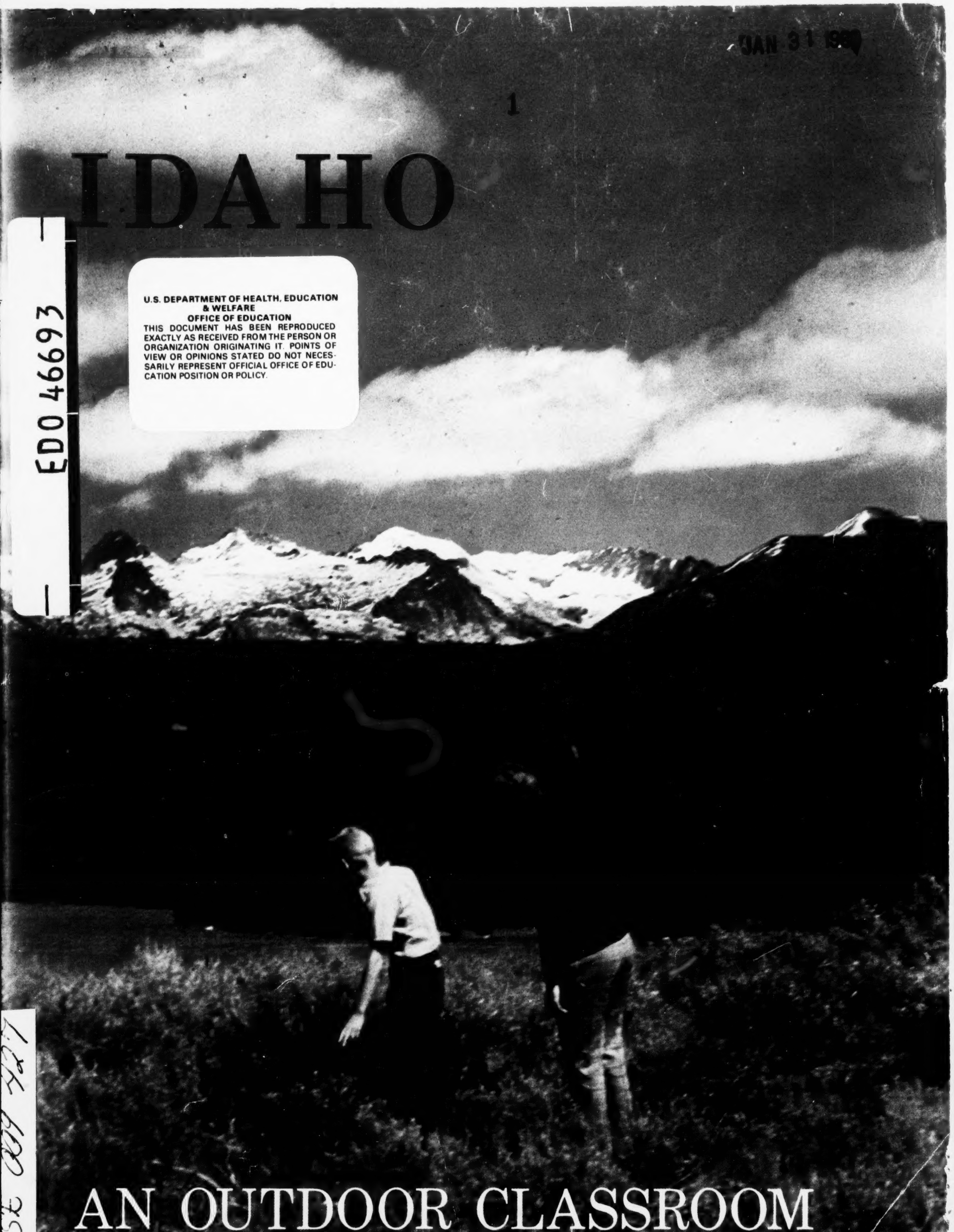
JAN 31 19[illegible]

1

IDAHO

ED046693

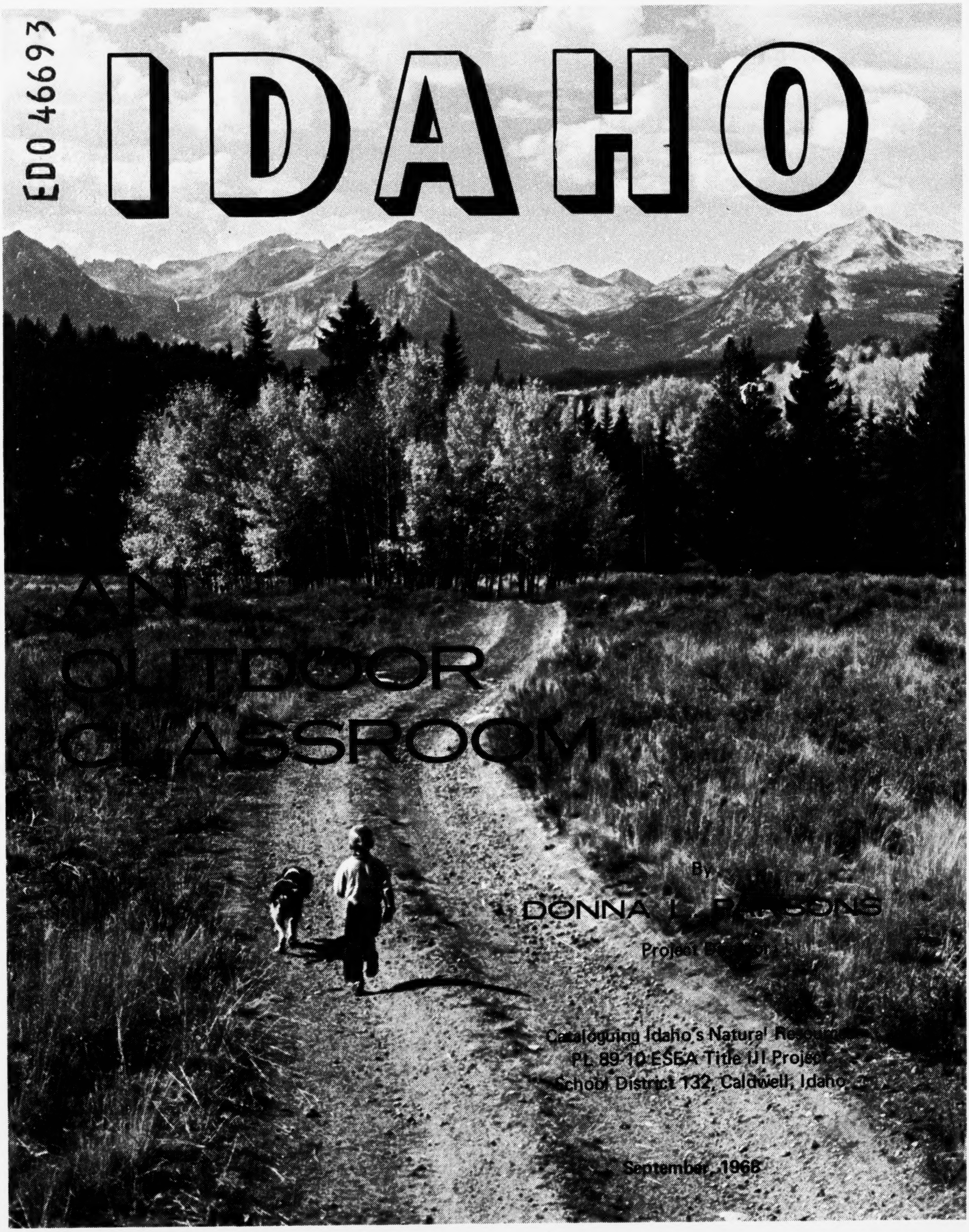
U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.



SE 009 427

AN OUTDOOR CLASSROOM

ED0 46693



IDAHO

AN OUTDOOR CLASSROOM

By

DONNA L. PARSONS

Project Director

Cataloguing Idaho's Natural Resources
PL 89-10 ESEA Title III Project
School District 132, Caldwell, Idaho

September, 1968

The work presented and reported herein
was performed pursuant to a Grant from the
U. S. Office of Education,
Grant No. OEG–3–7–704570–4972(056) Project No. 67–04570–7

Cover photo by Ernest Day, Boise, Idaho

Courtesy of Program of Outdoor Education
Title III Project P.L. 89-10
American Falls School District No. 381

Published by Blue Star Advertising and Publishing, 109 Main, Nyssa, Oregon

PREFACE

This is not a textbook nor is it a scientifically documented research paper – it is intended as a practical guide to show teachers how to use the natural resources of Idaho in their teaching. Even though a great deal of material was contributed by others, I take full responsibility for any errors or omissions, for the final editing and decisions on what to include have been mine alone. Comprehensive coverage was not possible either geographically nor according to subject; because of time limitations, it was necessary to use information which was most readily available. Some areas of the state have not been touched; some areas of science have not been covered. It is hoped, however, that the tour guides included here will serve as models and samples to show what can be done, and that enough interest will be aroused by this publication that teachers and others will gather similar material and share it with their colleagues all over the state.

Acknowledgements

This publication is the result of a one-year project with a staff of two – a director and a secretary. However, it would never have been possible without the cooperative efforts of many people and agencies who provided information, suggestions and assistance. Only a few are noted by name here and within the text; nevertheless a sincere debt of gratitude is acknowledged to all.

Several who deserve special credit and thanks are Dr. Patricia Packard and Dorothy Reynolds of Caldwell, and Sylvia Ross of Moscow, who assisted in planning, in field work, and in writing road logs; Dr. Harry Caldwell, University of Idaho and Dr. Lyle Stanford, College of Idaho, who served as consultants; Richard Kay, State Science Consultant, who originally suggested the idea for the project, A. D. Luke, State Title III Director, who assisted in setting it up, and the Superintendent and board of School District 132 who sponsored the project.

Sketches and maps of the Snake River Canyon and Bass Pond were drawn by Nancy Norseen, New Meadows; all other maps, except forest service maps, were drawn by Rita Borchardt, Boise.

Very special thanks and appreciation are due Vella Edwards, my most capable and efficient secretary who did all the typing as well as taking care of the numerous details involved in a project of this type. Finally, to my husband, Ralph, and children, Ron, Julie and Don, who assisted me in the search for natural resources all over the state, and cheerfully took over extra duties at home to let me devote extra time to the project, go my deepest gratitude and appreciation.

Donna L. Parsons

TABLE OF CONTENTS

Preface and Acknowledgements 3
Introduction 5
  Purpose 5
  Sources of Material 5
  How To Use The Book 6
  Maps 6
  Collecting 6
  Public Lands in Idaho 7
  Geology and Geography 11
  Vegetation Zones 11
  Animals 13
Outdoor Education 14
Schoolground Tours 15
Geomorphic Provinces 19
Section 1 – North Idaho Tours 21
Section 2 – Southwest Idaho Tours 64
Section 3 – Southeast Idaho Tours 153
Study Trip Guides 202
Place Names in Idaho 208
Bibliography 209
Index 212

INTRODUCTION

A major goal of science education is to create an awareness and understanding of the world in which we live, including the physical features as well as the living organisms. Idaho has an abundance of natural resources that can be used to produce such an awareness and understanding, but these resources are not being used to their fullest because of lack of knowledge by teachers of their location.

PURPOSE

The purpose of this book, therefore, is to make such knowledge available to teachers – to tell them about places that are suitable for field trips – to pinpoint special areas where students can study and learn by direct experience in the outdoors.

Man survives by utilizing the resources of his environment. His ability to **take** is virtually unlimited. On the other hand, man's ability to **manage** his environmental resources so he will be able to continue to use them is woefully inadequate. The ability to manage – wise resource use – is based on knowing and understanding the living things and materials of the environment. It is the responsibility of the teachers of the state to help their students **learn about** and **understand** the natural resources of Idaho, for the students of today are the decision and policy makers of tomorrow. This can best be done by contact, by direct experience – for outdoor study provides a comprehensive understanding of the total environment that can be gained in no other way. Concepts evolved from varied self-learned outdoor experiences have more meaning and more applications than do those taught as abstract statement. We need **ecological awareness**, a blending of field and classroom experiences that will develop greater interest, awareness, understanding, and respect for our environment.

SOURCES OF MATERIAL

This material has been gathered from many sources, including the following governmental agencies and departments:

State Departments

Fish and Game
Highways
Public Lands
Parks
Commerce and Development
Mine Inspector
Historical Society
Bureau of Reclamation
Bureau of Mines and Geology

Federal Agencies

Geological Survey
Soil Conservation Service
Bureau of Land Management
Forest Service

Personnel of these agencies furnished technical publications and other official material, as well as sharing their personal knowledge; teachers and students from Idaho schools, colleges and universities have been most cooperative and have contributed information, including tours written especially for this book. Many others have shared their knowledge of Idaho's natural resources, and there is a great deal of material remaining in our files which we were not able to include here because of lack of space. However, we have selected representative information and tour guides and included them here to serve as models and guides – to show teachers what kind of resources are available in Idaho, and how they might be used for study. Several different formats are used; this is due to the fact that tour guides have been written by different people, and also because they deal with different kinds of features.

HOW TO USE THE BOOK

The tour guides and study trip guides are arranged in three sections, based on geographical regions of the state (see map, p. 20). It is suggested that you read over the tours for your section; if you can take a complete tour, fine. If you can take only part of a tour, do so. If you can't find any that are near enough or that suit your purpose, look in the other sections, and perhaps you will find some ideas for developing your own tours. Use these as a base and take off from here.

If you can't take a field trip as a class, tell the students about these places and perhaps their parents will take them on a "family field trip". If you don't feel you can leave the schoolground, refer to SCHOOLGROUND TOURS and follow Dr. Matt Brennan's suggestions which can be adapted for any area. Every schoolground in the state possesses natural resources that can provide fascinating adventures in outdoor learning for students. If the adjoining areas, vacant lots, lawns, irrigation ditches, roads, fields, and parks within walking distances are included, the natural resources are multiplied many times over.

Wherever your school is, you live in a kind of environment. Learn all you can about its soil, its water supply, its plants and animals; most important, try to find how all these things are related to one another, to the community, to you and your students, to the state and nation as a whole. Careful consideration of the resources present in the immediate vicinity of the school will reveal much to the discerning eyes of the teacher who wants to use everything the environment has to offer in teaching.

MAPS

The location of specific features and sites for field trips and tours requires maps, and the best maps for this purpose are the U.S. Geological Survey topographic maps. Not all of Idaho has been surveyed, but there are topographic maps available for almost every section, except the more isolated desert or mountain regions. You are strongly urged to purchase the maps for your own locality. These four-color maps show not only the roads and cultural features such as towns, railroads, bridges, mines, buildings, churches, schools, and cemeteries, but they also locate and name all the streams, lakes, rivers, and mountains; because each section is numbered, features can be easily located. Historic sites are also shown. These are all contour maps, which means the elevations are shown by contour lines. Maps presently sell for 50c each, with substantial discounts on large orders. Information regarding purchase of these maps may be obtained from the Distribution Section, Geological Survey, Federal Center, Denver, Colorado 80225.

The Idaho Highway Department also prints individual maps of each county. These show all the roads, towns, buildings, lakes, etc., but are printed in black and white rather than in color and do not show elevation. However, they do show more detail than the state highway map and are available for some areas not covered by the U.S.G.S. maps.

COLLECTING

A word of caution should be given in regard to collecting. While it is doubtful if there is any harm in making collections of weeds or insects, some species of flowering plants have been completely eliminated in certain localities by over-zealous collectors. Students should not be encouraged to collect whole plants including roots, nor should flowers be picked indiscriminately; there are state laws protecting wildflowers – familiarize yourself with these. However, special permits for scientific collecting of both plants and animals can be obtained from the State Land Department and the Idaho Fish and Game Department in Boise.

There are special federal laws regarding collecting of petrified wood and minerals from public land; and both federal and state laws prohibiting removal of artifacts or excavation of archaelogical and vertebrate paleontological sites on public lands. Just because ¾ of Idaho is publicly owned doesn't mean that the resources of such land are free for the taking.

Private land, of course, should never even be visited without permission. Respect NO TRESPASSING signs – these are often for your protection as well as for the land owner's. Field trips provide excellent opportunities to train students in respect for laws and the rights of others.

COMMUNITY RESOURCES

There is no need for you to go alone. Every community in Idaho has a rock hound, a birder, a forester, a soil conservationist, and an extension agent. Seek them out. Tell them you are interested in using the things in the area around the school and in the community. You will be amazed at not only the quantity but the quality of help that is available for the asking.

PUBLIC LANDS IN IDAHO

Almost 75% of Idaho is owned by the federal or state government, so there is a good chance that any place you go on a field trip will be on public land.

FEDERAL LAND:

National Forests

There are 15 national forests wholly or partially in Idaho administered by regional offices in Missoula, Montana, and Ogden, Utah. These are dedicated to the principle of multiple use management of the forest resources for sustained yields of wood, water, forage, wildlife and recreation. Any area that can be used for recreation can also be used for educational study, although this use is not emphasized as strongly. The national forests maintain nurseries and plantations where forest management practices may be observed. Control of insect infestation, replanting following fires, and control of erosion can all be seen in various areas. Included here (Page 9) is a map of a portion of the Caribou National Forest in eastern Idaho showing some of the various features – historical, geological and biological – which can be visited there. Similar features can be found in any forest of the state and you are encouraged to search these out for yourself. The Forest Service has many excellent maps, brochures and booklets available for classroom use. Information concerning these and special locations in the forests can be obtained by writing the Education Officers at the two regional offices. These are: Mr. K. A. Kaney, U.S. Forest Service, Northern Region, Missoula, Montana 59801, and Mr. Hal Mickelson, U.S. Forest Service, Intermountain Region, Ogden, Utah 84401. These men and others on their staff in the regional offices, plus personnel in the forest supervisors' offices and district rangers' offices in the individual forests have contributed a great deal of information on resources of Idaho for this publication and are very willing to assist local teachers and schools in any way possible.

CARIBOU NATIONAL FOREST

1. Lander Trail, constructed in 1858; 30 years thereafter was heavily used as a wagon road by pioneers.

2. Oneida Salt Works started in 1866 – produced as much as one million pounds of salt a year in the 1870's. Freighted to Montana, Oregon, Washington and the Boise Basin over the Lander Trail.

   The Salt Works and Lander Trail sites may be visited by driving to the Stump Creek Guard Station near the Idaho-Wyoming line.

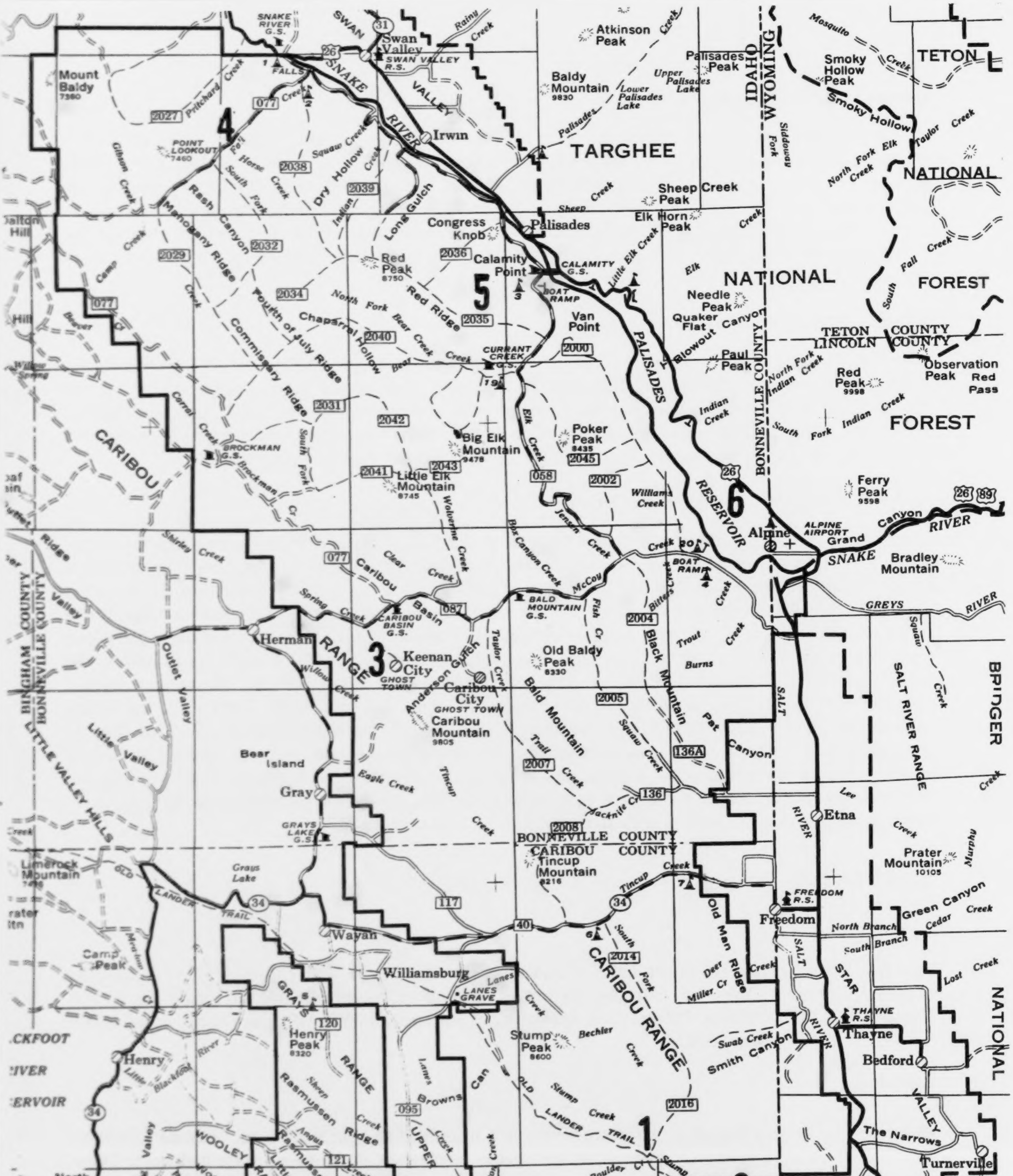
3. Keenan City and Caribou City. Placer gold mined from 1870 to 1900. Copper mined in 1943. Now little evidence of the towns remain.

   Can be visited by pickup or jeep.

4. Fall Creek – a wide variety of interesting resources and activities can be observed in this important drainage.
   a. Falls – the water of the creek falls 30 to 50 feet into the Snake River. The mineral deposit building around the falls is travertine. There is a cave below the falls.
   b. Travertine deposits.
   c. Winter feeding ground.
   d. Little Currant Creek Forest Fire; started August, 1966, by a picnic fire; 775 acres burned. Original cost of fighting the fire was $50,000; valuable deer range was destroyed (now replanted with bitterbrush) and floods have originated here causing erosion and silting.
   e. Phosphate mines.
   f. Recreation; fishing, picnicking, hunging, hiking, berry picking and sightseeing.
   g. Nature study and bird watching.

5. Calamity Point, an igneous intrusion thrusting up through the Swan Valley Fault, named because of the dangerous bend in the river, now under water. Legend has it that several men lost their lives at this point while floating large rafts of logs to the sawmills.

6. Palisades Reservoir Wildlife Area – a good place for study of migratory waterfowl.



TARGHEE
NATIONAL
FOREST
TETON
NATIONAL
FOREST
BRIDGER
NATIONAL
CARIBOU
IDAHO
WYOMING
BONNEVILLE COUNTY
TETON COUNTY
LINCOLN COUNTY
BINGHAM COUNTY
BONNEVILLE COUNTY
CARIBOU COUNTY
1
2
3
4
5
6
Swan Valley
Swan Valley R.S.
Snake River G.S.
Falls
Irwin
Palisades
Calamity Point
Calamity G.S.
Boat Ramp
Currant Creek G.S.
Alpine
Alpine Airport
Grand Canyon
Snake River
Palisades Reservoir
Herman
Caribou Basin G.S.
Keenan City
Caribou City
Ghost Town
Bald Mountain G.S.
Brockman G.S.
Gray
Grays Lake G.S.
Grays Lake
Wayan
Williamsburg
Lanes Grave
Henry
Trail G.S.
Etna
Freedom
Freedom R.S.
Thayne
Thayne R.S.
Bedford
Turnerville
Auburn
Grover
Old Salt Works
Stump Creek G.S.
Mount Baldy 7360
Point Lookout 7460
Atkinson Peak
Baldy Mountain 9830
Palisades Peak
Upper Palisades Lake
Lower Palisades Lake
Smoky Hollow Peak
Sheep Creek Peak
Elk Horn Peak
Congress Knob
Red Peak 8750
Van Point
Needle Peak
Quaker Flat
Paul Peak
Red Peak 9998
Observation Peak
Red Pass
Poker Peak 8435
Big Elk Mountain 9478
Little Elk Mountain 8745
Ferry Peak 9598
Bradley Mountain
Old Baldy Peak 8330
Caribou Mountain 9805
Tincup Mountain 8216
Prater Mountain 10105
Henry Peak 8320
Stump Peak 8600
Diamond Peak
Camp Peak
Limerock Mountain
North Cone
Bear Island
Caribou Range
Grays Range
Rasmussen Ridge
Wooley Range
Salt River Range
Little Valley Hills
Red Ridge
Mahogany Ridge
Commissary Ridge
Fourth of July Ridge
Black Mountain
Old Man Ridge
Smith Canyon
Old Lander Trail
Webster Range
Upper Valley
Dry Valley
Star Valley
The Narrows
Greys River
Salt River
Blackfoot River Reservoir
Swan Valley
26
31
34
89
2000
2002
2004
2005
2007
2008
2014
2016
2023
2027
2029
2031
2032
2034
2035
2036
2038
2039
2040
2041
2042
2043
2045
2050
058
077
087
095
117
120
121
136
136A
40
Scale
0 1 2 3 4 5 6 Miles

Bureau of Land Management

The BLM manages over 12 million acres of land in Idaho that has always been public domain – that is, publicly owned; most of this is used for grazing livestock, but a 1965 law lists ten multiple uses including in addition to grazing, watershed, wildlife habitat, recreation, mining, etc. Special use permits can be obtained from both BLM and Forest Service by schools interested in setting up study plots or developing outdoor education sites at a nominal cost to the schools. Contact the Director at the State BLM Office in the Federal Building in Boise, or one of the six district offices throughout the state.

National Wildlife Refuges

The five National Wildlife Refuges in Idaho were established to provide habitat and protection for migratory waterfowl, but beyond this they also provide a bit of natural landscape where the full spectrum of native wildlife can find food, shelter and protection and which the public can visit to see the "wildlife display". These make excellent sites for bird watching and ecological study. See individual tour guides and study trip guides for information on specific refuges.

National Monument: Craters of the Moon

Idaho's only national monument is the Craters of the Moon, located west of Arco on the Snake River Plain in southern Idaho. A spectacular display of lava flows, cinder cones, lava tube caves and other volcanic features, it also features a nature trail along which can be seen some of the more than 200 species of trees and plants of the area. Animals of the area include a large insect population, mammals of all sizes from chipmunks and ground squirrels to deer, antelope and black bear, and many birds, including the golden eagle and the mountain bluebird, which both nest in the area. A colorfully illustrated book, Geology of Craters of the Moon National Monument, by Dr. Harold T. Stearns, can be obtained by writing to the Superintendent, Craters of the Moon Monument, Arco, Idaho 83213, and enclosing $1.00. Paul Fritz, Superintendent, and his staff of naturalists will be glad to cooperate fully with any group wishing to tour the area or do special research within the monument. A large group campground is available for students. If you live too far away to visit it during the school year, arrange for summer field trips with your students, or at least encourage them to visit it with their families on vacation trips.

STATE LANDS:

State Forests

The five State Forests are Priest Lake, Floodwood, Orofino, Lolo, and Payette Lakes, comprising over 423,000 acres. These are managed for timber production, recreation and watershed protection. Contact R. L. Lingenfelter, Information Specialist, Idaho Department of Public Lands, Boise, Idaho 83707, for more information.

State Parks

Several of the twenty-five state parks are mentioned in individual tour guides, for they are excellent sites for outdoor education and are easily accessible, as most of them are on state highways. These range in size from one to 7,838 acres and in elevation from 1,850 feet to 6,500 feet so they provide a wide range of habitats and study sites. Since organization as a separate department in 1965, remarkable progress has been made in expanding existing parks and developing new ones under the able direction of Wilhelm Beckert, Director, and Jon Soderblom, Assistant Director. Contact the Idaho Department of Parks, Boise, Idaho 83707, for a map showing the location of each park and a listing which describes the facilities of each.

GEOLOGY AND GEOGRAPHY

No attempt will be made here to explain the geology of Idaho, because it is covered so clearly and completely in **Idaho Earth Science**, by Sylvia Ross and Carl Savage of the Idaho Bureau of Mines and Geology. Written primarily for earth science teachers in Idaho schools, it covers geology, geography, climate, soils, minerals and water resources of the state. It should be considered a companion volume to this book, for its descriptions, tables, maps, sketches and glossary will be of great help in explaining many of the terms and features described in these tours. It may be ordered from Sylvia Ross, Idaho Bureau of Mines, Moscow, Idaho 83843, for $4.00. Although written for earth science teachers, it is highly recommended for elementary teachers, biology teachers and others as well, for all the factors of the environment are related and an understanding of the physical factors is essential to understanding living organisms and their relationship. It is the first in a new Earth Science Series – publications on caves, and on fossils are planned for the future.

VEGETATION ZONES IN IDAHO

By Carol Molsee, College of Idaho, Caldwell, Idaho

Different plant species grow in different environments and plants living in one type of environment are seldom found in another because certain requirements are missing. Ecologists call a natural plant community a bio-climate or life zone.

Because Idaho has 12,000 feet of topographic relief, the vegetation shows greater relationship to altitude (elevation) than latitude. Altitude and latitude actually have little if any correlation in plant life zones. It is generally accepted that each life zone reaches its best development within certain limits of altitude. The climatic change is so complete in Idaho that life zones can be easily recognized by *plant indicators.*

The knowledge of these zones is invaluable to the field biologist, for it tells him what kinds of forest trees, range vegetation, wildlife, and cultivated crops do best in or best utilize each life zone. The zones within Idaho, as described by Dr. R. F. Daubenmire, Washington State University, are:

1. Sagebrush-grass zone.

The Snake River Plain and larger valleys support sagebrush, *(Artemisia tridentata)**, buckbrush, horsebrush, and many grasses. This zone is used as range for cattle and sheep, and is an important habitat for antelope. Unfortunately most of the desirable grasses were eliminated by overgrazing when the plain was first settled. Today it is irrigated and used to grow hay, grain, potatoes, beets and other crops. The most alkaline soils, on which sagebrush cannot grow, support greasewood *(Sarcobatus vermiculatus),* hop sage, shadscale, and winterfat. This plant community is important as a winter range for sheep. Very sandy soil in this zone is characterized by rabbitbrush *(Chrysothamnus spp.).*

2. Wheatgrass-bluegrass zone.

Elevations too low for forest are found in the valleys of the Salmon, Clearwater, and Snake Rivers. Bluebunch wheatgrass *(Agropyron spicatum)* and Idaho fescue, along with Sandberg's bluegrass *(Poa secunda)* completely dominate the warm, dry prairies.

3. Fescue-wheatgrass zone.

On the high, moist prairie extending southeastward from southern Latah County to north central

---

*The scientific name when given indicates that the plant is a life zone indicator when found to be a dominant or abundant plant.

Idaho County, bluebunch wheatgrass *(Agropyron spicatum)* develops a rhizomatous habit not found in the wheatgrass-bluegrass zone. However, the grasses are not conspicuous here for the forbs dominate.

On level topography the most conspicuous dominants include the little sunflower, balsamroot, Indian paintbrush, mariposa or sego lily, lupine, wild geranium, and other forbs.

On the north-facing slopes the herbs give way to dense thickets of wild rose, snowberry, chokecherry, cottonwood and hawthorn. In poorly-drained areas rushes, western blue-flag or iris, buttercups, lupine and camas are found. Bluegrass is absent from the undisturbed areas. The greater part of this prairie has been converted for crops of wheat and peas.

4. Oak-mountain mahogany zone.

Mountain mahogany *(Cercocarpus ledifolius),* bitterbrush *(Purshia tridentata),* serviceberry, and buckbrush are the dominating shrubs of this zone of which the best example is in the Rocky Mountains south of Idaho. None of the oak genera extend into Idaho. The best examples that can be found in Idaho are south of the Snake River and east of the longitude of American Falls. Conifers are completely absent from this zone.

5. Juniper-pinon zone.

This zone is less well represented than the oak-mountain mahogany zone with the best examples found farther south. Cedar or juniper *(Juniper utahensis, J. scopulorum, J. occidentalis),* single leaf pinon *(Pinus microphylla),* and limber pine *(Pinus flexilis)* are found on isolated hills and low mountains just above the sagebrush plain. Rarely are the species found growing together. Ponderosa pine is usually absent. It is used as spring-fall range for cattle and sheep.

6. Ponderosa pine zone.

The lowest of the true forest zones is dominated by ponderosa pine *(Pinus ponderosa)* with all other conifers absent. The forest canopy is thin allowing a well-developed undergrowth including grasses, forbs and shrubs of ninebark, spiraea, wild rose, and snowberry.

It is best represented along the west edge of the mountains from Boise County northward and in the Salmon River Valley. It is an especially important zone with high value for summer grazing and for ponderosa pine, the second most valuable timber produced in Idaho. Much of this zone is now used to raise wheat, peas, beans, lentils, and alfalfa.

7. Douglas fir zone.

Douglas fir *(Pseudotsuga taxifolia)* is found at the upper edge of the ponderosa pine zone. Undergrowth includes pine grass, elk sedge, serviceberry, bitter cherry, wild rose, buckbrush, and mountain spray. After a fire, lodgepole pine or western larch will form a temporary forest before being reinvaded by ponderosa pine. This zone is used for grazing in summer and early fall, and also supports big game animals.

8. Arborvitae-hemlock zone.

Above the Douglas fir zone the western arborvitae or western red cedar *(Thuya plicata),* western hemlock *(Tsuga heterophylla)* and grand fir *(Abies grandis)* are found. The undergrowth includes yew and many herbs.

Western white pine *(Pinus monticola)* is often the first temporary forest tree to invade the arborvitae-hemlock zone after a fire. Aspen, black cottonwood, western larch, lodgepole pine, and other conifers will also move into a burned area. This plant community is highly valued with the western white pine being the most valuable timber tree in Idaho. The Western arborvitae is valued for telephone poles. This zone is best examplified north from the Salmon and Clearwater River divide.

9. Spruce-fir zone.

The spruce-fir zone is the last true forest zone. This zone includes subalpine fir *(Abies lasiocarpa)*, and mountain hemlock *(Tsuga mertensiana)*. The undergrowth includes Fool's huckleberry and grouse-berry, which are abundant only in this zone, and the white flowered rhododendron and woodrush which are confined to it. This is a very important region as a watershed. The mountain grasses occurring at timberline are used principally as summer sheep ranges.

10. Alpine zone.

Idaho has few peaks ranging above the timberline. This zone is represented only by occasional plants and crustose lichens. No true alpine zone exists as such in Idaho.

The field biologist should remember that there is no one place where all of these zones can be observed, nor are the boundaries between them distinct. They often fuse into each other, but as mentioned before the dominant plants serve as indicators which help identify the separate zones.

ANIMALS OF IDAHO

Animals require varying habitats according to their particular adaptations in structure, physiology and behavior. Since Idaho is a diversified state with considerable geographic and environmental variation, its animal population is rich and varied. With its immense spread in altitude and latitude, the state has within its borders several physiographic provinces (see map, Figure 1). The northern Panhandle and central mountains are part of the Northern Rocky Mountain Province; the Palouse Country and the Snake River Plains are included in the Columbia Plateau; the desert regions south of the Snake River Plains belong to the Basin and Range Province (Great Basin); and the eastern corner of the state is part of the Middle Rocky Mountain Province. Each of these has its characteristic vegetation zones (described in the preceding section), and these in turn have their associated animals.

There are no non-professional or popular books on the fauna of Idaho, but here, listed in order of publication, are the few technical works that deal specifically with Idaho animals:

The Recent Mammals of Idaho, W. B. Davis, 1939, 350 pages
Guide to Idaho Birds, Larrison, Tucker and Jollie, 1967, 220 pages (paperback)
Guide to Idaho Mammals, Earl J. Larrison, 1967, 164 pages (paperback)
The Amphibians of Idaho, Edson Fichter and Allan Linder, 1964, 33 page, (paperback)

These contain few illustrations and no colored pictures or photographs, so are limited as field guides for identification. Students and teachers, therefore, are referred to the Peterson Field Guides, published by Houghton-Mifflin; animals are covered in five separate Guides – Mammals, Western Birds, Western Reptiles and Amphibians, Butterflies, and Animal Tracks. These are practical and inexpensive.

OUTDOOR EDUCATION

Many schools in Idaho have "outdoor education" for this occurs whenever learning takes place in the outdoors, but the most outstanding effort in Idaho at present is the **Program of Outdoor Education**, a Title III (ESEA) Project sponsored by the American Falls School District. It covers 59 school districts in 22 counties in southern Idaho, and its purpose is the same as that of this project – to extend and enrich formal classroom experiences by utilizing the outdoors as a resource for discovery, concentrating especially on entering 7th grade students.

The staff, which consists of Harry Shimada, Jr., Director, and Denis Dubois and David Faith, Regional Supervisors, is working to show teachers how outdoor activities can enrich school experiences – not just in science but in every area. In the summer of 1968, ten pilot schools developed a four-week program at their local schools to provide meaningful opportunities for students to experience and clarify their understanding of the relationships between the classroom and the outdoor environment. Teachers opened their classroom doors to expose new vistas of learning; they accompanied their pupils into the living classroom to observe nature and life at first hand and to learn by "doing." Activities in the summer outdoor program were many and varied, but everything pointed toward the culminating event – a week-long Resident Experience either at the Warm River Camp in eastern Idaho, or at a camp near Sun Valley, where students and teachers shared a living-learning experience. Stimulated by their teachers, the youngsters cut across traditional classroom subject areas to engage in a wide variety of learning experiences. Although there were only ten participating schools in 1968, it is hoped that eventually every student in every school district will be involved in the program.

Ideally, this project should be extended to cover the entire state at all grade levels, K-12, and plans are now being made by the **Program of Outdoor Education** in cooperation with the State Department of Education for a **State Environmental Education Center** with one site to be developed as a pilot project to serve as a resident camp not only for outdoor education, but also for foreign language, Indian education, special education, and even to provide a place where adults can learn new skills to help them make better use of their environment.

In addition, the State Board of Education's Committee on Outdoor Education is planning a **Governor's Conference on Conservation and Outdoor Education** to be held in the spring of 1969 to focus attention on the many efforts in the state which are presently being carried on by teachers, professors, state and federal agencies, and industry, all of which should be coordinated and expanded. The primary purpose of all of this is to make students more aware of their surroundings and help them learn how to use resources wisely to keep the environment fit for life and fit for living.

For further information, contact Mr. Shimada, School District 381, American Falls, Idaho 83211, or Richard Kay, State Science Consultant, Department of Education, Statehouse, Boise, Idaho 83707.

Participating Pilot Schools 1968

American Falls School District 381
Bonneville School District 93
Butte County 111
Cassia County 151
Firth School District 59
Grace School District 148
Idaho Falls School District 91
Jerome School District 261
Minidoka School District 331
Snake River District 52

SCHOOLGROUND TOURS

The outdoors provides stimulus and opportunities which cannot be provided indoors. Students need field experience as well as indoor lab experiences – beginning with the first year of school, so here are some suggestions for field work that can be done on the schoolgrounds, in any section of the state, by students of any age, kindergarten through the 12th grade.

The following material, written by Dr. Matthew Brennan, Director of the Pinchot Institute for Conservation Studies, first appeared in **Science and Children**, the National Science Teachers Association's publication for elementary teachers.* This could be easily adapted for junior high or high school students also.

TREES KEEP A DIARY (December, 1964)

by Matthew Brennan

Trees keep a diary. Let us go out to any place where trees grow to look at the diaries they keep. December is a good time. The trees in most parts of the country are bare and ready for inspection. Any tree will do, evergreens included, and if there are no trees on the schoolground, surely there are some within walking distance.

Like all living things, trees are individuals. They are sensitive to, and react to, their environment. (A major concept to work around.) You will never find two trees just alike. Or will you?

The diaries of trees logically begin with where the trees come from. Do they all have single stems or are they growing in clumps? Do single trees start the same way as clumps? Or, do all oaks from little acorns grow? Look for a stump which has been cut and has sprouted for the answer. What has happened to the trees since they sprouted? Are they bent, twisted, forked, split, or cracked? Have they been struck by lightning (and did the lightning travel up or down the tree), damage by insects or fungus, burned in a forest fire, browsed by a deer? What other animals or plants have lived in them or on them?

Each one of these signs indicates an entry in the diary of a tree. Let your students guess what happened in each case. Now they can put some of their guesses to the test of observation and checking for more or different evidence. Some of their entries will not be easy. Damage to a tree which has been broken off or bent over when another fell on it, is easy to identify. Others which suffered cuts, bruises, and burns may have since covered them up. Trees form scars over injured tissues. See if you can find a scar. Look for an open wound. Is new bark forming at the edges? Have other plants or animals taken advantage of the tree's injury to move in? Do you see any evidence of insect damage, or bracket fungi, which indicates decay in the tree's interior?

After you have discovered some of the types of damage which trees suffer, you can move on to the next entries in the diary. What did the tree do, in addition to forming a scar tissue? Look for a tree that has been bent down to the ground. Did the tip die? Or did it turn up to the light? Have some of the side branches turned up to form new trees? Are some trees bent by prevailing winds or the weight of snow?

Look for forked trees, especially conifers. Trees do not normally fork and form double tops. This is caused by damage or loss of the growing tip – it may be eaten off, broken off, or killed by insects. Is the fork low enough to have resulted from deer browse? Is it a kind of tree that deer eat? A fork higher up in a tree may have been caused by a grouse eating the tip bud.

*Reproduced with permission from **Science and Children**, National Science Teachers Association, 1201 Sixteenth Street N.W., Washington, D.C. 20036

Do all trees grow tall and straight, or short and bushy? Is there a relationshop between the shape and size of a tree and its environment? Its soil, water, crowding, etc.?

You may be in an area where trees have been cut recently. If so, there are many things you can find out about the life of a tree by a close examination of its stump. By looking carefully at a stump, you can answer some of these questions:

1. Was the tree dead or alive when it was cut?
2. Which way did it fall?
3. How many men worked in cutting the tree?
4. Where did they stand?
5. At what time of the year was it cut?
6. How long ago?
7. At what time of the year did it grow most?

Do not be alarmed. Those are easy questions. But each one of them requires the application of a little scientific knowledge or reasoning. Here are a few clues to get you started. But even these clues will be other questions. Try this instead of giving answers to your children. It is good teaching.

1. Is the bark attached to a dead tree? If not, what would happen to it when hit by a saw?
2. Just look!
3. Are the saw marks straight across the stump, or are they radiating out from one side?
4. Did the last wood grow in the spring (big pores) or summer?
5. Any sprouts around? How old are they? (They keep a diary too.)

Perhaps you have noticed that I have not mentioned a word about the names of trees or how to identify them in this lesson. If your children find certain trees interesting, they will want to learn their names. If they do not find them interesting, the names will be unimportant to them. All the lessons to be learned from reading the diaries of trees cannot be learned in a day, a year, or a lifetime.

LEAVES (March, 1965)

By: Matthew Brennan

In the spring, go out and look for leaves. Look for tree or shrub buds that are just opening. Observe how the new leaves are folded. Are they all the same? How long does it take for a bud and its leaves to open? How many leaves are there in a bud? Are all trees the same? All oak trees?

Mark some buds and have them checked every hour. I call this research, although some of my laboratory-oriented friends would smile at the idea. You be the judge. Have your class try to find the answer in any of the ways they ordinarily seek information – in the library, in a text, from an expert. The students may decide that it is easier, more scientific, and a lot more fun to do their own research. Even if they find an answer somewhere along the line, it should be checked with their own data. They may even develop a scientific attitude toward finding answers to their questions, toward the words of the specialist, and toward the information in their text and reference books.

While you are studying new spring leaves, why not make a leaf collection? The most beautiful leaf collection I have ever seen was done by a fourth-grader. There were thirty-seven different leaves in her collection. Best of all, they were all on one page – perfect miniatures just out of the bud. The only equipment needed is a book for pressing, one sheet of paper, and a roll of cellophane tape. Try it!

While you are out collecting leaves, notice how the leaves are arranged on the new stems. Some are opposite each other on the stem, some alternate. Scientists use these arrangements, as well as other characteristics of shape and structure which your children will notice, to identify trees. (Do not worry too much about identification.) Let the children see the remarkable designs. Let them see how the arrangements allow each leaf to receive its share of sunlight – the energy to make its food. If these experiences are satisfying, they will want to identify their specimens.

Have all the buds opened? Suppose there is a late spring frost which kills the new buds. Suppose the buds and young leaves are eaten by deer or grouse? Will the tree or branch die? Look for small, unopened buds along the stem. Break off the newly opened buds at the end of the branches. (Be sure to do this on side branches so you will not alter the growth of the tree's top.) Mark each branch. What happens to the small, unopened buds? You can do this just as well with conifers – the pines, firs, and spruces. Does this help to explain the trees with bent or forked trunks?

You can extend this lesson for days, or weeks. Keep a record of what happens to the new leaves. What animals eat them? What animals eat the animals that eat the leaves? In other words, what happens to the energy captured by the leaves from the sun? Could it ever become the energy for a man? (Is there a child in your class who has ever eaten a nut, a grouse, or a deer?)

Next we shall visit a pond.

A POND IN SPRING (April, 1965)

By: Matthew Brennan

Communities are places where people live. Communities are also places where animals and plants live. A pond is one of these communities. So, let us make tracks today to a pond – any pond, big, little, deep, shallow, clear, or muddy. It does not matter what kind of pond you visit because all ponds are different. Some are quiet. Others have a noticeable current running through them. Each one is different chemically, depending on whether the inlet water ran over limestone, granite, or shale. Ponds are all different physically. Some are muddy, depending on the condition of the surrounding land which drains into the pond – its watershed – whether it is well covered with trees or grass, or left bare by poor lumbering practices, overgrazing, or fire.

But ponds do have many characteristics which are similar. All of them are holes in the earth which are filled with water. All have an inlet, or a source of water, and an outlet for drainage. All of them have a multitude of living things which use the pond as a home.

Just as the waters in your pond vary from one place to another, so do the plants and animals living in them. Each pond has in it those things which are adapted to life under the conditions found there. Like any community, the lives and actions of each inhabitant affects the life of every other inhabitant. Like all communities, your pond is constantly changing. Every individual that dies, every adjustment to a new condition, causes the community to change.

We call the scientists who study communities, the relationships among their inhabitants, and the changes in them, ecologists. So today we will be ecologists.

As you approach the pond, stop and look around. Note the topography – the lay of the land. What land areas are drained into the pond? Over what kinds of rocks does the inlet stream flow? What kind of soil? Is the pond muddy? Why? Is it because of man's activities? If so, can your class do something about it? Move quietly about the pond since the wildlife along its edge or on its surface will not wait around to see what a noisy class is up to. Take one more overall look at the pond before you see what is in it – one look to see what the pond really represents in the master plan for the world we live in. Ecologists look on a pond as a stage in the orderly growth, aging, and evolution of the earth. They see a pond as a step in the development of a forest or a grassland. Everyday, the pond is moving toward this end. Let us see if we can find the evidences of this development.

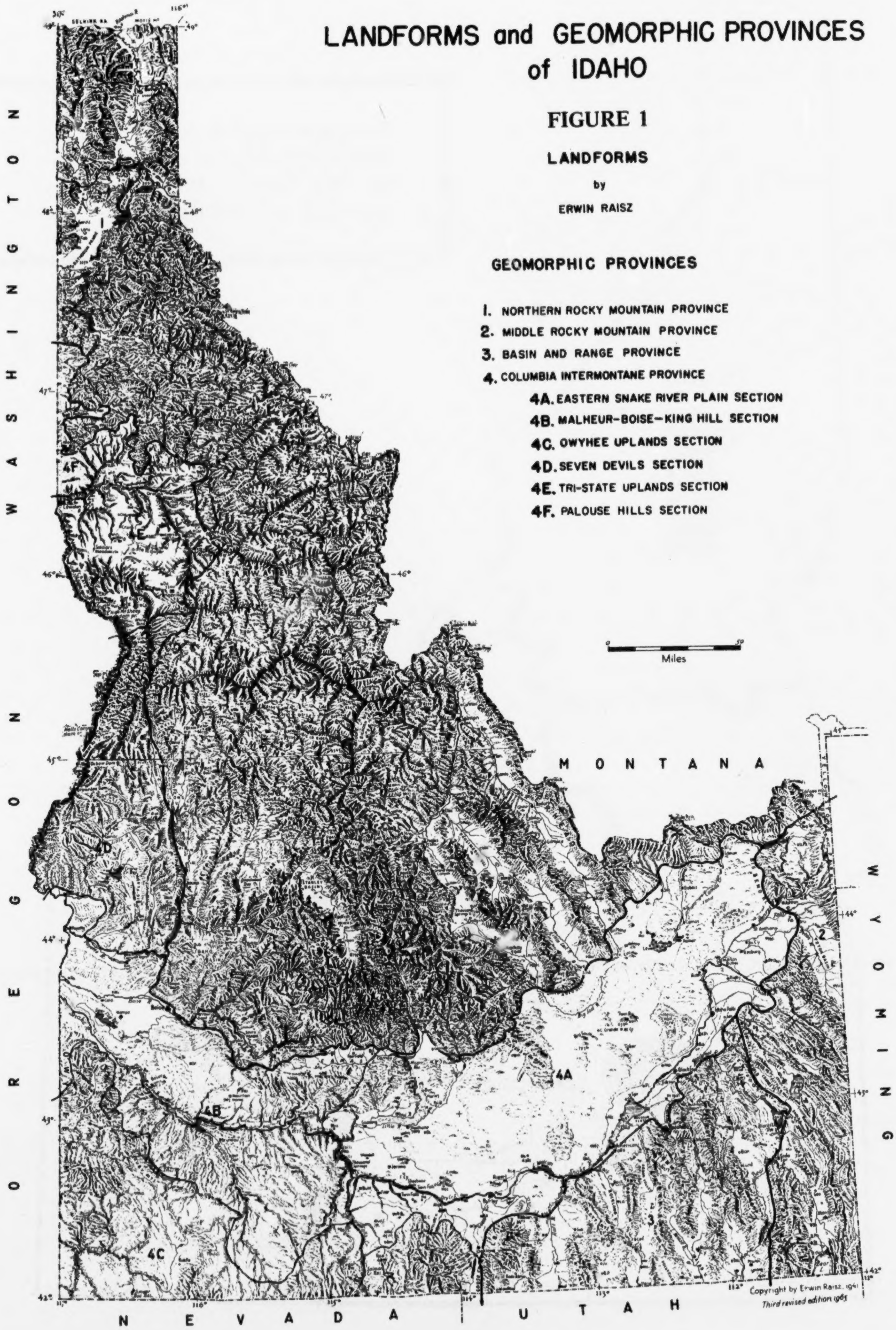
Look at the shoreline. You can distinguish the zones of plant life found there. First is the floating zone at the edge of the open water. These plants have no contact with the bottom. Next is the zone of emergent plants. They have their roots in the soil at the bottom of the pond, but extend above its surface. Next are the plants in the zone at water's edge, with their roots in the wet soil, but not submerged. Moving back away from the edge of the pond, you can see the zone of shrubs, and, finally, the forest or grassland zone. You will note that each zone is progressively drier, as more soil is added to the bottom of the pond. Look carefully to see how the decaying remains of plants in each zone are helping to build up soil. Now that you have seen these things, you will be able to recognize level places along the road which were once ponds filled with water. Most people do not realize that this constant filling in of the world's ponds is having an effect on the available water supply for an expanding population. Your children will be able to see why it is important for man to prevent the soil from being washed into the nation's ponds everyday. For in many cases, this washed soil can fill a pond in a short period of time, which otherwise may have taken hundreds of years by natural process.

You will note that, once again, I have not mentioned the names of all the plants which your children will see along the shore of the pond. Do not worry about the names now. Many a potential science interest has been killed by too much emphasis on naming things. Often we ask our children to learn in one afternoon trip the names of plants, animals, and other things, which we have taken years to learn. Instead, let them gain an understanding of the concept of a pond as a thriving community of living things, as a stage in the development of the earth, and as a constantly changing laboratory, ready to be studied and enjoyed. If they find the pond community (or any other) interesting, they will want to learn the names of its inhabitants. Well, we have come to the end of another lesson. Let us come back to the pond next month when the water will be warmer and see what is in it for science out of doors.

WHY USE OUTDOOR CLASSROOMS?

Why should you want to take your class outdoors? It is easier and better to teach some things outdoors by direct experience, and things learned by direct experience are never forgotten. Teaching outdoors is just good teaching – teaching by direct experience. It is new and exciting. It is challenging. You will be asked questions you cannot answer. Do not be embarrassed. You can all learn together. If you knew all the answers to the puzzles of nature and the world we live in, you would not be teaching where you are.

Teaching is the most wonderful job in the world. It can also be a great deal of fun, especially in the outdoors, where you can come face to face with the world, its pleasures and problems.



LANDFORMS and GEOMORPHIC PROVINCES of IDAHO

FIGURE 1

LANDFORMS
by
ERWIN RAISZ

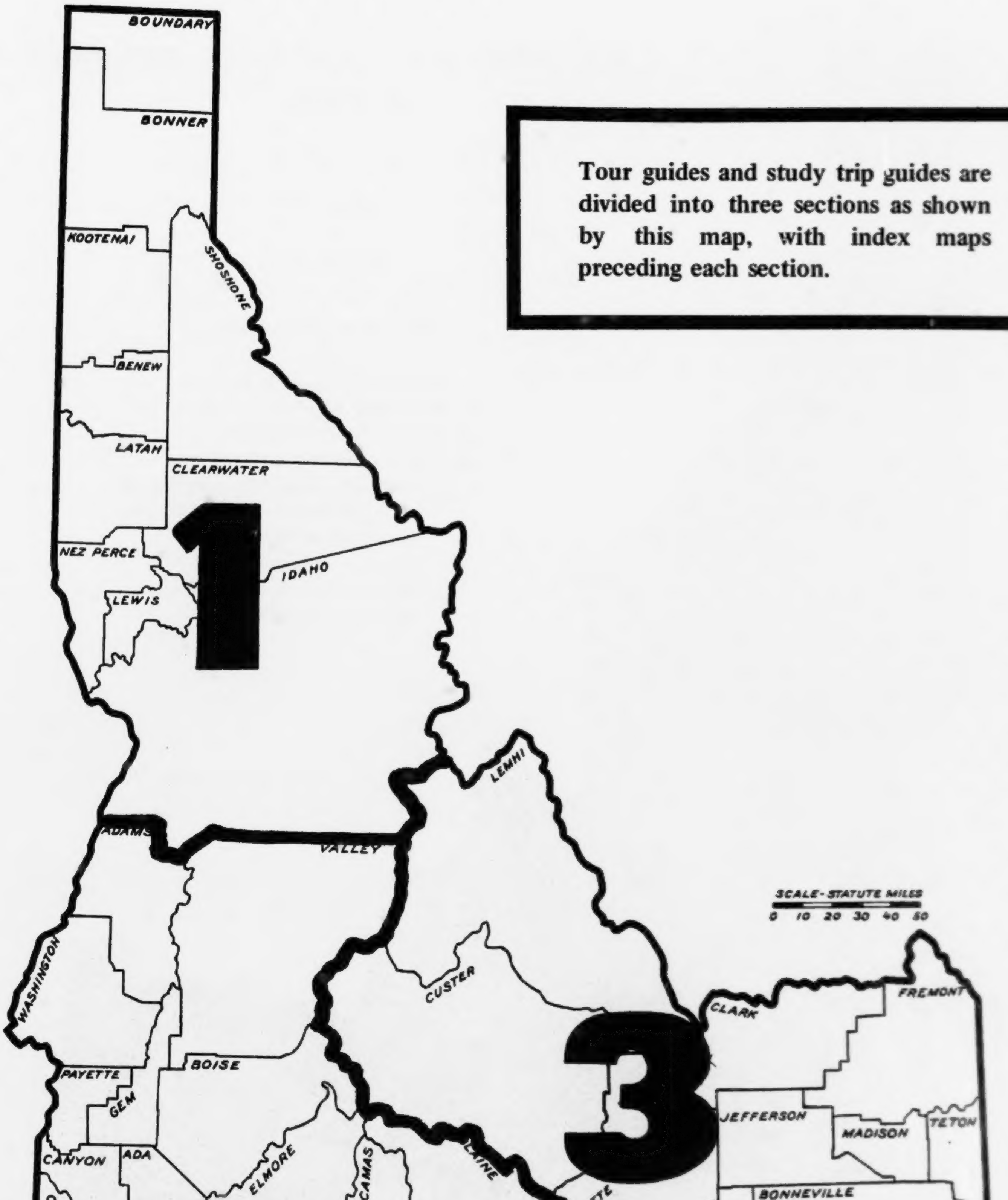
GEOMORPHIC PROVINCES

1. NORTHERN ROCKY MOUNTAIN PROVINCE
2. MIDDLE ROCKY MOUNTAIN PROVINCE
3. BASIN AND RANGE PROVINCE
4. COLUMBIA INTERMONTANE PROVINCE
    - 4A. EASTERN SNAKE RIVER PLAIN SECTION
    - 4B. MALHEUR–BOISE–KING HILL SECTION
    - 4C. OWYHEE UPLANDS SECTION
    - 4D. SEVEN DEVILS SECTION
    - 4E. TRI-STATE UPLANDS SECTION
    - 4F. PALOUSE HILLS SECTION

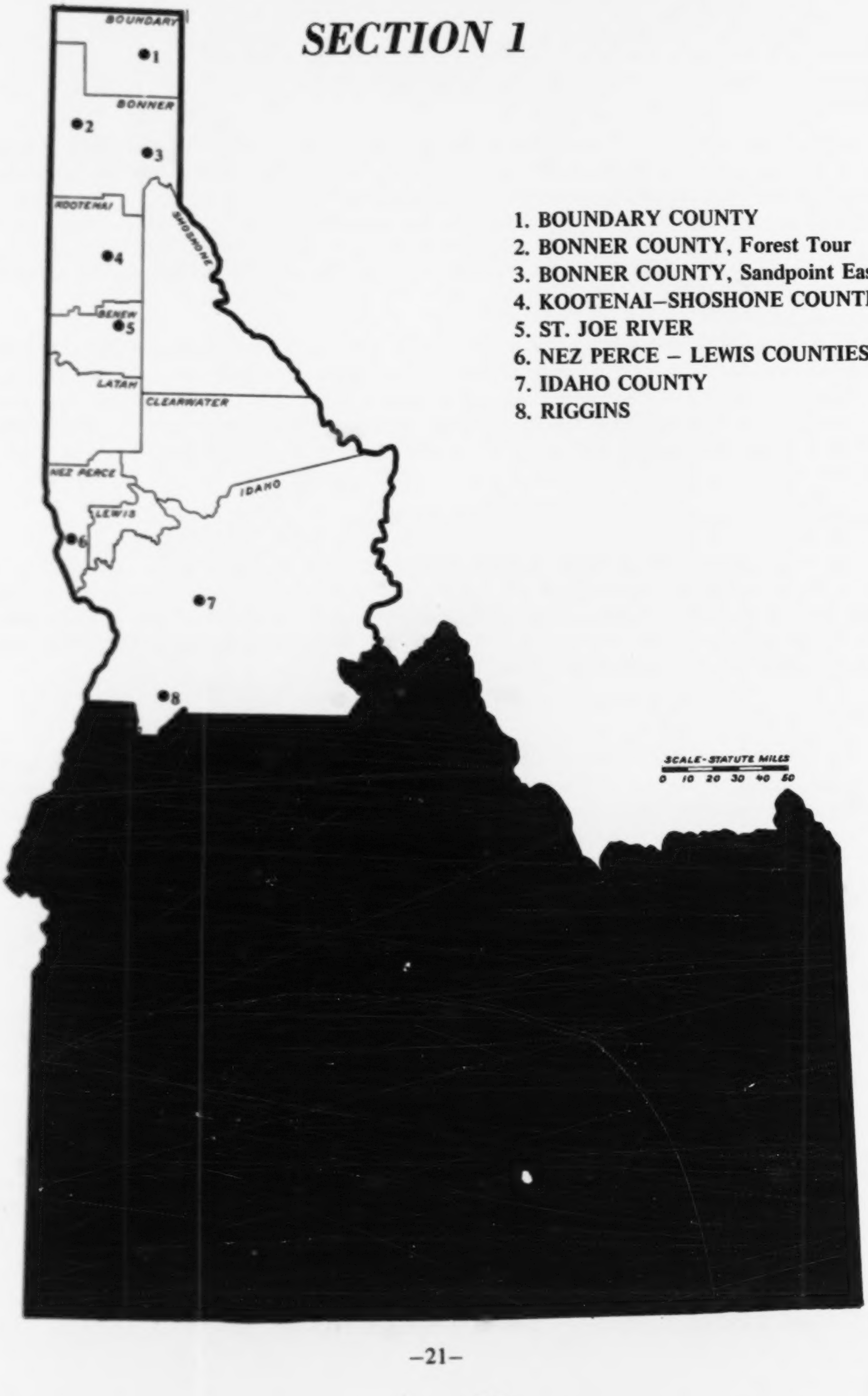
WASHINGTON
OREGON
MONTANA
WYOMING
NEVADA
UTAH
SELKIRK RA.
1
2
3
4A
4B
4C
4D
4E
4F
49°
48°
47°
46°
45°
44°
43°
42°
116°
0
50
Miles

Copyright by Erwin Raisz, 1941
Third revised edition 1965

Tour guides and study trip guides are divided into three sections as shown by this map, with index maps preceding each section.


BOUNDARY
BONNER
KOOTENAI
SHOSHONE
BENEW
LATAH
CLEARWATER
1
NEZ PERCE
IDAHO
LEWIS
ADAMS
VALLEY
LEMHI
WASHINGTON
CUSTER
SCALE - STATUTE MILES
0 10 20 30 40 50
FREMONT
CLARK
3
PAYETTE
BOISE
GEM
JEFFERSON
MADISON
TETON
CANYON
ADA
ELMORE
CAMAS
BLAINE
BUTTE
BONNEVILLE
OWYHEE
BINGHAM
2
GOODING
LINCOLN
MINIDOKA
POWER
BANNOCK
CARIBOU
JEROME
TWIN FALLS
CASSIA
BEAR LAKE
ONEIDA
FRANKLIN

SECTION 1


BOUNDARY
BONNER
KOOTENAI
SHOSHONE
BENEW
LATAH
CLEARWATER
NEZ PERCE
LEWIS
IDAHO
1
2
3
4
5
6
7
8
SCALE-STATUTE MILES
0 10 20 30 40 50

1. BOUNDARY COUNTY
2. BONNER COUNTY, Forest Tour
3. BONNER COUNTY, Sandpoint East
4. KOOTENAI–SHOSHONE COUNTIES
5. ST. JOE RIVER
6. NEZ PERCE – LEWIS COUNTIES
7. IDAHO COUNTY
8. RIGGINS

BOUNDARY COUNTY

GENERAL

Extending across Idaho from Washington to Montana and joining Canada on the north, Boundary County is Idaho's northernmost county. There are few roads in the western part – a factor which contributed to the difficulty of controlling the disastrous forest fires of 1967. The forests and many beautiful lakes of the Selkirk Mountains are visited by hunters, fishermen and others in search of recreation but are not easily accessible by highway. This is not meant to dismiss the area as being unworthy of study but means investigation might be more difficult because of the lack of roads.

However, since the entire western half of the county is either in the Kaniksu National Forest or belongs to the state, information can be readily obtained from the Forest Service or the State Land Department. In fact, the only part of the county that is not owned by either the state or federal government is the L-shaped Kootenai River Valley. There are many opportunities in the county for studying geology and ecology and some of the most interesting features can be viewed from the highways.

GEOLOGY*

Some of the oldest rocks in North America are found here – Precambrian metamorphic and volcanic rocks about one billion years old. These have been invaded by the younger granitic rocks of the Kaniksu Batholith. Pleistocene lake sediments, one million years old, fill most of the valleys. Several large faults cross the county and U.S. 95 follows the main fault in a north-south direction. There are two major folds and several minor ones.

TRENCH

Running right through the middle of the county is one of the most outstanding geological features of northern Idaho – the Purcell Trench. This is a magnificent structural valley which extends from near Sandpoint northward into Canada. Although its origin is not clear, it is apparently fault-related and has been enormously deepened and widened by glacial action. At one time it evidently was filled with water (part of an ancient lake over 100 miles long which extended into Canada), and it undoubtedly served as the drainage channel for all of the Panhandle before a glacier left a small ridge near Elmira, dividing the Kootenai Valley from Pend Oreille Valley. Look for evidence of glacial action, and for lake deposits (sand deposits and dunes, swamps, moraines, terraces) along U.S. 95 which runs north-south through the county, ending at Eastport (population 100) on the Canadian border.

The elevation ranges from an exceptionally low (for Idaho) 1,740 feet in the valley to 7,357 feet on Gunsight Peak in the Selkirks.

KOOTENAI RIVER AND FLOODING

It has been said that the Kootenai just pays Idaho a visit on its way to the ocean for after arising in British Columbia, it flows south into the United States looping down through the northwestern corner of Montana, and then goes north again through Idaho into Canada, where it passes through Kootenay Lake and drains into the Columbia River.

---

*For more information on the geology of this area see: Geology & Ore Deposits of Boundary County, Idaho, Kirkham & Ellis: Idaho Bureau of Mines Bulletin 10, 1926.

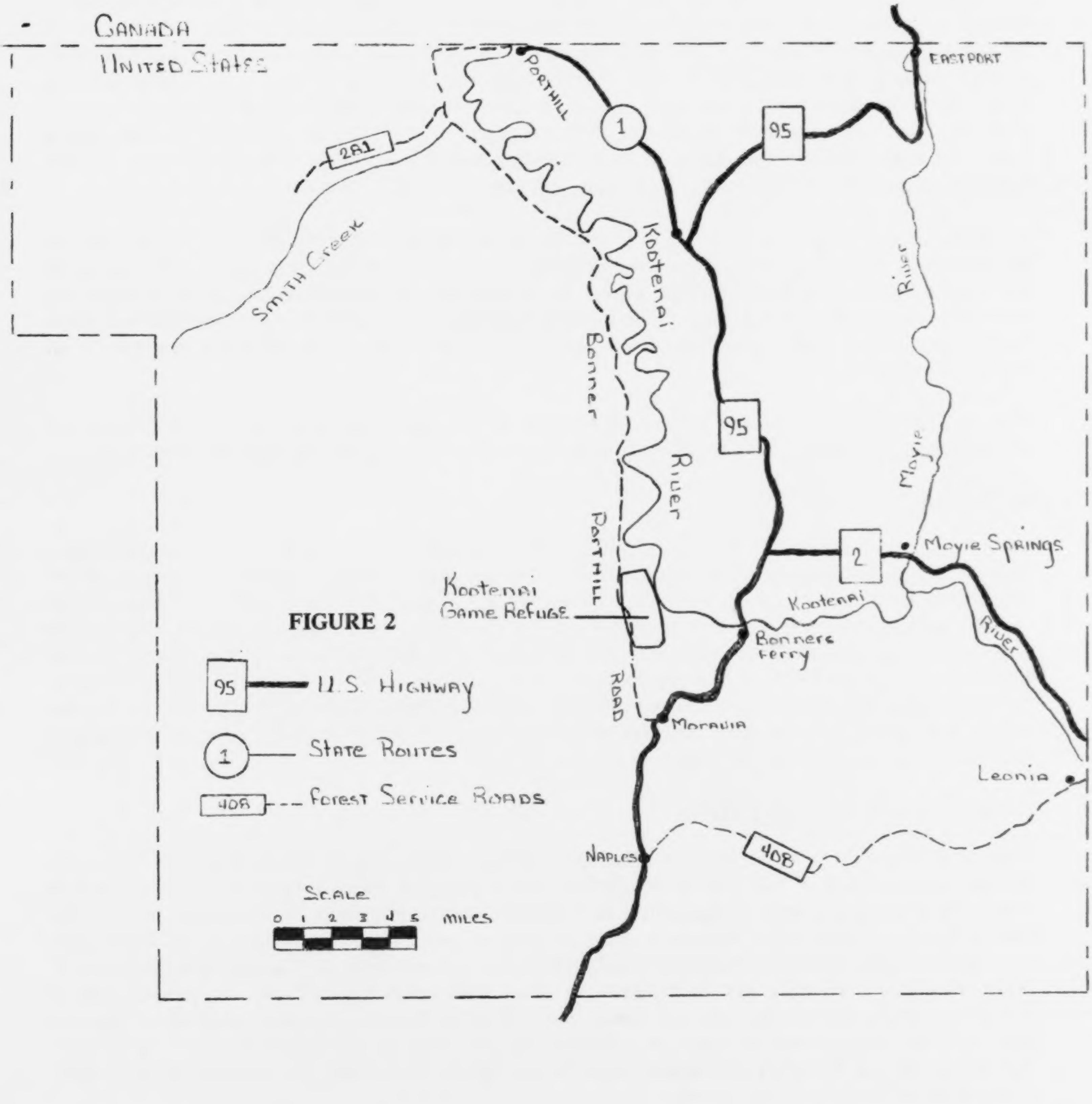

CANADA
UNITED STATES
PORTHILL
1
95
2A1
Smith Creek
Kootenai
River
Bonner
Porthill
Road
95
River
Moyie
2
Moyie Springs
Kootenai
River
Kootenai Game Refuge
Bonners Ferry
Moravia
EASTPORT
95
U.S. Highway
1
State Routes
408
Forest Service Roads
Leonia
Naples
408
Scale
0 1 2 3 4 5 miles

FIGURE 2

Although only a small portion of its 400-mile length is in Idaho, this river has been responsible for more newsworthy flood occurrences during the last hundred years than any other stream in Idaho. The damage occurs in the portion from Bonners Ferry to the Canadian border where it meanders through a gently sloping alluvial valley in the Purcell Trench. Reclamation of this fertile valley (3 to 6 miles wide) was begun in 1921 with the construction of dikes along 66 miles of river, until at present levees protect over 34,000 acres of land, including 200 acres in the town of Bonners Ferry itself. Even the dikes and levees have not protected the land from flooding. The levee areas in Kootenai Flats are vulnerable to damage from relatively frequent floods and from seepage during high river stages. Look for evidence of both flooding and flood control. Here can be seen graphic examples of how the environment affects man and how man affects the environment.

Overtopping and failure of levees during six floods in the last fifteen years have resulted in the inundation of large areas of land, the complete loss of crops in flooded areas and damages to levees and improvements. Estimated average annual flood damages are $880,000. The flood of 1948 was especially disastrous. Elimination of damaging flooding will hopefully be accomplished upon completion of the Libby Dam, begun in 1966, on the Kootenai River, 17 miles upstream from Libby, Montana.

The meandering nature of the river is illustrated by the fact that in a straight-line distance of approximately 30 miles, over 66 miles of levees and dikes were required to edge the river.

ECONOMY

Farming persists in this area in spite of the recurrent floods, because of the fertile soil and proper amount of precipitation and high water table. There are many Grade A dairies and because of the large amount of alfalfa raised here, tons of honey are shipped from this area every year. Wheat growing and lumbering add to the economy of the area. Some of the land along the river belongs to the Kootenai Indians, who lease it to the farmers. The Indian Mission is located 2 miles west of the town of Bonners Ferry. A few remaining Kootenai still hunt, fish, gather roots, and pick berries but some farm and others work in local industry. Although there are many prospects, there are few mines; lead, silver, and zinc have been found in lodes and gold occurs in placer deposits, but mining has never been of major importance.

GAME REFUGE AND WILDLIFE

West of Bonners Ferry is the Kootenai National Wildlife Refuge with 2,700 acres lying between the Bonner-Porthill Road at the foot of the Selkirk Mountains and the Kootenai River. Established in 1965, the primary purpose of the refuge is to provide habitat and food for ducks and geese of the Pacific Flyway. Other water birds now using the area are great blue heron, killdeer, sandpiper, gull, tern, Stellar's jay, Lewis and pileated woodpeckers and upland birds such as pheasants and grouse. Whitetailed and mule deer and black bears are often seen along Myrtle Creek on the west side of the refuge. Plans for nature trails and blinds from which wildlife may be photographed are planned and will be constructed as soon as possible, so this will be an ideal "outdoor classroom". Arrangements can be made for group visits to the refuge by calling the manager at AN7-3888, Bonners Ferry (see study trip guide).

Incidentally, the only herd of caribou in the U.S. lives in the Kaniksu National Forest north of here near the border.

MOYIE RIVER

East of Bonners Ferry, U.S. 2 crosses the picturesque Moyie River. From a viewpoint east of the bridge, the dam and plants which supply power for the Bonners Ferry area may be seen. Although parking on the bridge is not permitted, there is a walkway on the bridge from which the spectacular falls and gorge just below the dam can be seen. To the south is the narrow canyon through which the Moyie travels before joining the Kootenai a mile below this point. Note the contrast between the Moyie River, which has all the characteristics of a youthful river – falls, rapids, narrow V-shaped canyon – with the Kootenai River which shows definite signs of old age as it meanders across a broad flood plain. The power plant is open to visitors during the day. Below the dam and to the right are the remains of the old road which was quite treacherous due to the sloughing of rock and dirt from above. The Moyie River arises in Canada, flows south into Idaho where it joins the Kootenai, and then returns to Canada.

There is a small lumber mill at the community of Moyie Springs, southwest of the bridge.

MOUNTAINS AND CREEKS

North of the game refuge from the Bonner-Porthill Road, roads lead up into the Selkirk Mountains along Bald Creek and Trout Creek and, just a few miles south of the border, up Smith's Creek, an especially lovely rocky creek with numerous cascades and pools which furnish not only excellent fishing but opportunities for studying water life, vegetation, and plant communities.

The Selkirks are composed of the intrusive granitic rocks of the Kaniksu Batholith which have been glaciated several times; the last such action may have been as recent as 4,000 years ago. The glaciers carved deep cirques (basins) now filled with lovely glacial tarns (lakes) on the sides of the rugged peaks. Here can be studied mountain glaciation as well as mountain ecology. The Kootenai River separates the Purcell Mountains in the north from the Cabinet Mountains in the south. These also have been glaciated and although not as high as the Selkirks, also have lovely lakes and alpine forests.

FLORA

Wild flowers are abundant during late spring and early summer. Sego lilies, fire weed, lupine, trillium, Indian paintbrush, dog toothed violet, lady slipper, shooting star, birds beak and the exotic bear grass can be seen in meadows along the road.

Trees of the arbor vitae-hemlock, spruce-fir and alpine zones cover the mountains of Boundary County. Ancient cedars, 100-foot tall white pines, stocky ponderosa pines, hemlock, larch, Douglas fir, and others common to these zones make up the complex community called a forest.

Contrast the kind of vegetation seen in the valley (elevation about 1,750 feet) with the kind seen in other parts of the state having the same elevation, for example, Brownlee Dam in Hells Canyon (1,830 feet) or Culdesac (1,687 feet). Look up at the hills and mountains. They are heavily timbered, even at elevations of 2,000 and 3,000 with alpine vegetation at 6,000 or 7,000 feet. Compare this with the plants and trees seen near Mountain Home (3,110 feet), Boise (2,700 feet) and Weiser (2,100 feet). How much of this contrast is due to differences in latitude? amount of rainfall? soil types? climate? What factors determine the kind of vegetation that grows in any area?

GLACIAL FEATURES

South of Bonners Ferry, evidence of erosion by streams and glacial ice can be seen. In places the roadcuts consist of almost pure sand. Note how much more easily this type of material is eroded than more consolidated sediments. Although some roadcuts are covered with grass to control erosion, others are still bare and gullied. Slopes are quite steep and some are more than a hundred feet high. Note the many ponds and swamps along the highway. Any one of these would make an excellent study site. What connection might they have with glaciers? There are several rest stops along Highway 95, which follows Deep Creek for a short distance, which offer opportunities to examine the soil, rocks, and plants along the creek.

SCENIC DRIVE

An especially scenic route with educational value is the Twentymile Creek Road (Forest Service Road 408) which goes east from Naples to Leonia, right across the Cabinet Mountains. Open only in the summer, and not passable to school busses, this road climbs up through the ponderosa pine, fir, spruce, white pine, larch and alpine species. Along Boulder Creek, on the east side of the divide can be seen the results of hydraulic mining near the Idaho Gold and Ruby Mine. There are seven switchbacks just above Leonia, which is right on the Idaho-Montana border. From here U.S. 2 goes north along the Kootenai River past Moyie Falls and back to Bonners Ferry.

FIRE

The forests of this area have been affected by fire many different times. The Sundance fire of 1967 burned 56,910 acres of national forest, state and private land between Bonners Ferry and Priest Lake. Look for evidence of fire, both recent and of older times, throughout the county. The road up the Pack River from Samuels (in Bonner County) leads right into the Sundance fire zone.

NAPLES PLANTATION

South of Naples, watch for the sign pointing to the "Naples Plantation", which consists of ponderosa pine planted in 1953. An adjacent 30-year old natural stand has had extensive improvement work done.

Contrast the two areas with each other and with surrounding vegetation. What evidence is there of man's influence – is it constructive or destructive? The plantation is under the direction of the Sandpoint Ranger District of the Kaniksu National Forest.

MANAGEMENT AREA

Just north of the Boundary-Bonner County line is the Idaho Fish and Game Boundary County Wildlife Management Area. Located on the site of an old dam which impounded a 200-acre marsh, this area can be used to demonstrate the relationship between factors of the environment and to illustrate how man can adjust these factors for his own needs (in this case, to improve fishing and hunting).

Contact the Resident Manager at the headquarters on U.S. 95 for guided tours or further information concerning the area (Box 95, Naples, Idaho 83847, ph. 267-8475).

BONNER COUNTY

Bonner County, like Boundary County from which it was divided in 1915, extends the full width of the Idaho Panhandle. It is possible in this county to cross the entire width of the state – about 46 miles at this point – by water. In fact, this water route from Albeni Falls on the Washington border up the Pend Oreille River, through Pend Oreille Lake and up the Clark Fork River to Montana was very popular with the prospectors and miners from California and other western regions in the early days.

Early settlements followed establishment of trading posts, first at Kullyspell House in 1809 and later near a Hudson Bay Post. Although gold, silver, lead and copper have been mined ever since the 1880's mining has not been a major industry for years. Excellent stands of white, ponderosa and lodgepole pine, as well as Engelmann spruce, larch, red cedar and Douglas fir make forestry and forest products one of the most important industries in the county. Agriculture and tourism are other sources of income.

GEOLOGY*

A glaciated area, Bonner County includes parts of three ranges of mountains, the Selkirks, the Cabinets and the Coeur d'Alenes. Like Boundary County to the north, much of the county is part of either the Kaniksu Forest or the Idaho State Forest. The rugged, glaciated Selkirk Range is composed of the granite rock of the Kaniksu Batholith, while the Cabinets and Coeur d'Alenes are metamorphic rocks (Belt Series). In between the ranges are lake basins and broad valleys, the most prominent being the Purcell Trench, which extends north from Sandpoint into Canada, with branches southwest into Rathdrum Prairie and southeast to Clark Fork.

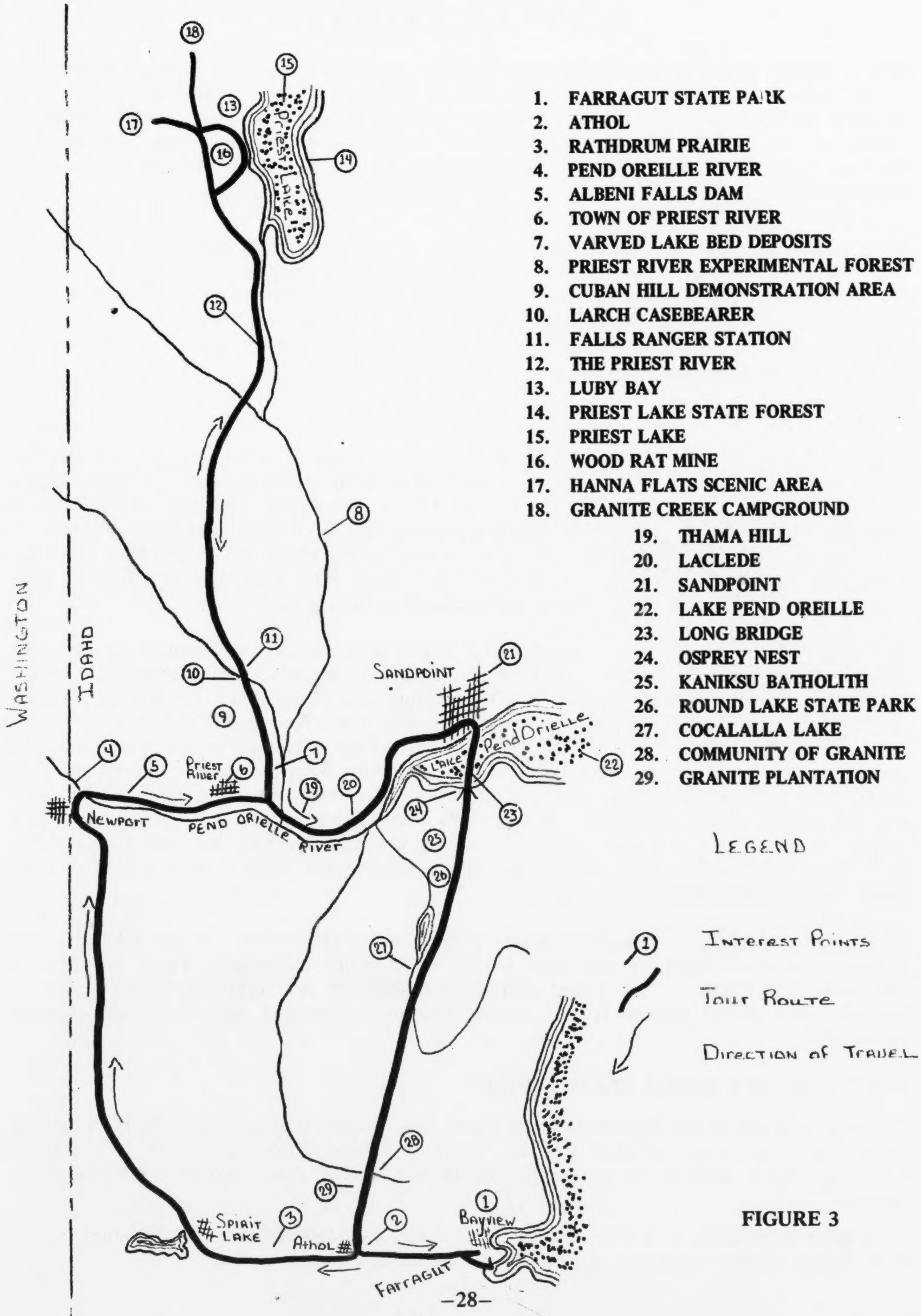
The origin of the trench is not entirely clear but it is apparently fault-related and has been enormously deepened and widened by a continental glacier which scoured out the Pend Oreille Lake basin. When the glacier receded, it left a morainal dam which closed the drainage channel, causing the formation of Lake Pend Oreille which is over 1,000 feet deep. The part of the trench not occupied by the lake has been eroded by streams and glacial ice, and evidences of this can be seen throughout the county. Other lakes on the valley floor, such as, Hayden, Barret, and Twin Lakes, were probably formed by moraines and outwash from the retreating glacier. There were evidently several periods of glaciation, that is, times of invasion by glacial ice. Post-glacial sand flats with a few sand dunes developed over sandy outwash deposits around Elmira, north of Sandpoint. Both Priest and Pack Rivers are sluggish, meandering streams, the result of disruption of drainage by deposits of glacial drift.

Albeni Falls was originally formed by gradual erosion of glacial outwash and lake sediments until bedrock was encountered by the Pend Oreille River in its downcutting. Other evidences of glaciation in the county are glacial cirques and peaks in the highlands, U-shaped valleys, ice-transported glacial erratics (rocks), roches moutonee (glaciated rocks) and glacial striae (scratches).

BONNER COUNTY FOREST SERVICE TOUR

This tour is based on the Kaniksu National Forest Conservation Tour conducted for the 1965 Girl Scout Senior Roundup. Although the tour begins at Farragut State Park, which is actually in Kootenai County, most of the route is through Bonner County. Refer to map of the tour route, figure 3.

*For more information on Bonner County see: Geology and Mineral Resources of Bonner County, C. N. Savage, County Report No. 6, 1967, Idaho Bureau of Mines.


18
15
13
17
16
Priest Lake
14
12
8
WASHINGTON
IDAHO
11
10
9
SANDPOINT
21
Lake Pend Orielle
22
4
5
Priest River
6
7
19
20
24
23
Newport
Pend Orielle River
25
26
27
LEGEND
1
Interest Points
Tour Route
Direction of Travel
28
29
Spirit Lake
3
Athol
2
1
Bayview
Farragut

1. FARRAGUT STATE PARK
2. ATHOL
3. RATHDRUM PRAIRIE
4. PEND OREILLE RIVER
5. ALBENI FALLS DAM
6. TOWN OF PRIEST RIVER
7. VARVED LAKE BED DEPOSITS
8. PRIEST RIVER EXPERIMENTAL FOREST
9. CUBAN HILL DEMONSTRATION AREA
10. LARCH CASEBEARER
11. FALLS RANGER STATION
12. THE PRIEST RIVER
13. LUBY BAY
14. PRIEST LAKE STATE FOREST
15. PRIEST LAKE
16. WOOD RAT MINE
17. HANNA FLATS SCENIC AREA
18. GRANITE CREEK CAMPGROUND
19. THAMA HILL
20. LACLEDE
21. SANDPOINT
22. LAKE PEND OREILLE
23. LONG BRIDGE
24. OSPREY NEST
25. KANIKSU BATHOLITH
26. ROUND LAKE STATE PARK
27. COCALALLA LAKE
28. COMMUNITY OF GRANITE
29. GRANITE PLANTATION

FIGURE 3

1. Farragut

During World War II, this was the site of the nation's second largest recruit training station, exceeded in size only by the Great Lakes Naval Training Station near Chicago. For a time, it was literally the largest city in Idaho. Decommissioned in 1946, a portion of the base housed Farragut College and Technical Institute for awhile. The buildings were later sold as surplus, razed and moved away. All that remains today are the drill fields and the perimeter fence. The U.S. Navy still maintains the David Taylor Model Basin at Bayview where deep water experiments and tests are conducted. Now a state park, Farragut is being developed for its recreational potential.

Take State Highway 54 west to Athol (population 214).

2. Athol

First settled in the 1880's, the coming of the railroad in 1881 allowed the timber sources to be exploited and a large sawmill and planer were built here. By 1908, the town boasted 2 hotels, 2 barber shops, 3 grocery stores, a pharmacy, 2 blacksmith shops and a number of saloons. After the sawmill burned in 1912, the town began to dwindle in size. It enjoyed a brief rebirth during the war but soon returned to its present state of slow decline.

3. Rathdrum Prairie

Continue west on Highway 54 from Athol. You are now crossing Rathdrum Prairie. This is a typical glacial outwash plain and extends southwest twenty miles to the Spokane Valley. The last glacial period filled the valley floor with a thick layer of loose glacial material (till) and this porous sand and gravel is a drain field for the many lakes bordering the valley.

Only Lake Pend Oreille and Coeur d'Alene Lake have surface outlets. Others, such as Spirit Lake, Hayden Lake and Hoodoo Lake have no outlets, yet the till is so porous the lakes do not get saltier as they would without drainage. An estimated 700,000 acre-feet of ground water per year moves from Pend Oreille Lake into the Spokane River beneath the Prairie.

At the junction with Highway 41, turn north and go through the town of Spirit Lake (population 693), a lumbering and resort town. Continue north on Highway 41. Look for evidence of the effects of glaciers on this area. Notice the difference between the terrain on the west and east side of the highway. Notice gravel pits along the side of the road.

Crossing briefly into Washington, pass through Newport and across the bridge to U.S. 195.

4. The Pend Oreille River

The Pend Oreille has its beginning under another name (the Clark Fork) in the Glacier National Park. It is one of the few rivers in the U.S. which flows north. Just before it enters Canada, it rushes through Z Canyon, 18 feet wide with solid rock walls towering 200 feet in height. In Canada it flows into the Columbia River, supplying approximately 42% of its water in a normal year.

First explored in 1809 by David Thompson, the English trapper and geographer whose purpose was to determine if it was possible to transport furs by boat down the river via the Columbia to the Pacific Coast, it was visited in 1844 by Jesuit Missionaries led by Father De Smet. In the 1850's gold was discovered along the river near Metaline Falls and it became an important supply and mail route. The first steamboat to ply the Pend Oreille River was built at Albeni Falls in 1887. Later, as many as 18 boats were operating on the river at one time, some capable of carrying 500 passengers. The building of the railroad down the river in 1909 ended the steamboat era.

5. Albeni Falls Dam

Authorized in 1950, the dam was completed in 1955 for flood control, navigation, power generation, conservation, and recreation.

The dam has the effect of increasing the length of Lake Pend Oreille by 20 miles. Prior to construction of the dam, the average annual variation between low water in the winter and high water in the spring was 13 to 14 feet, but the dam now stabilizes the level of Lake Pend Oreille except for the gradual winter let-down which releases water for downstream use, and provides storage capacity for heavy spring run-off upstream, improving navigation along the river and on the lake.

The lake behind the dam is important for recreation as well as from the fisheries and water fowl standpoints.

6. Town of Priest River

Continue east on U.S. 195 to Priest River, a logging community.

Turn north at Priest River and take Highway 57 toward Priest Lake.

7. Varved Lake Bed Deposits

In the first three miles north of the town, varved lake bed deposits can be seen in road cuts. These are dark layers of wet beds of sand and light layers of varved clay coated with dry overwash. They probably originated in a glacial lake formed when ice blocked the Pend Oreille River; sand and silt was deposited when the lake burst past the ice dam at 12 to 65 year intervals. These are quite noticeable along the highway and also across the valley in eroded hillsides. (For a complete description of this feature, see U.S. Geological Survey Professional Paper 575-B, ppB83-B87, by Dr. Eugene H. Walker.)

8. Priest River Experimental Forest

A road to the right leads to the Priest River Experimental Forest, located 7 miles east of the highway on the east side of Priest River. It is dedicated to the development of better methods of management and protection of forested lands and is maintained for research and demonstration purposes by the Intermountain Forest and Range Experiment Station of the U.S. Forest Service at Moscow, Idaho. Established in 1911, it covers 6,368 acres. Research at the forest has covered a wide variety of activities including nursery and planting, methods of timber cutting, investigations of tree species needs, fire research, development of white pine lumber yield and volume tables, seeding studies, flood control survey studies, snow and water run off, timber stand improvement, pruning studies, testing hybrid trees, and many other types of activities. The results of this research are made available to state and private forest land managers.

9. Cuban Hill Demonstration Area

Continue on Highway 57 to the Cuban Hill Demonstration Area. An interpretive sign explains the purpose of the plantation. The area was first logged in 1907. On August 3, 1931, a fire started at Freeman Lake, 6 miles to the west. In seven hours it swept over this area and to the east as far as the eye can see, burning a path 20 miles wide and 8 miles long. Thirty-six thousand acres of timber and farmland were burned. The fire blocked two highways, forced 26 families to flee for their lives, burned 34 ranches, and trapped hundreds of people. It took 1500 men 5 days to control the fire and 6 weeks to complete the 90 miles of fire lines around the fire.

In 1932 the Forest Service, using CCC labor, planted 340 acres with white pine seedlings. In succeeding years the ribes (currant and gooseberry plants) were eradicated to protect the stand from white pine blister rust. In the late 1950's rust-infected trees were treated with Actidione, an antibiotic. Old canker scars are still visible on many trees.

In the winter of 1961-62, one acre was thinned to give the better growing trees more growing room. The crop (best) trees were pruned to improve the quality of the future lumber.

This area is designed to illustrate the management practices needed to restock a cut-over or burned out area. Also shown are some of the management practices used to protect the trees and to increase the value and the volume at the time the tree crop is harvested.

10. Larch Casebearer

Watch for evidence of the effect of the Larch Casebearer on larch trees on the hillside in the next two miles. The insect was first detected in the area in 1957 and has now spread over more than two million acres in the tri-state area. Defoliated larch stand out in the green velvet of the forest as brown monuments to the larch casebearer's insatiable appetite.

Entomologists expect that eventually all the larch in the Northern Rocky Mountain Region will be infested. The explosive outbreak in the last 9 years indicates a lack of natural control. There are at least 3 known native parasites that attack the casebearer in the region, but they are apparently ineffective as a controlling factor.

In 1960 the Forest Service imported 2,000 small (1/8 inch long) parasitic wasps from the eastern United States. These were planted near St. Maries, Idaho, where their offspring were found in 1962 and 1963, indicating that they could survive in this climate. A control project was established on the Kaniksu, with a wasp-rearing cage at Sandpoint Ranger Station. Evidence of the project can be seen at the Falls Ranger Station. Note the cheesecloth sacks on the trees. However, it will be years before the parasite can be expected to exert a controlling influence on the casebearer population.

The casebearer is so named because it carries on its back a hollowed-out larch needle case as its home, much in the manner of a hermit crab.

11. Falls Ranger Station

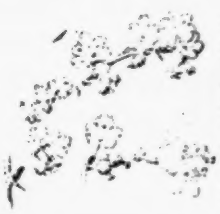
You will pass Falls Ranger Station on your right. Look for evidence of fire as you travel through this area. What advantages and disadvantages result from forest fires?

12. The Priest River

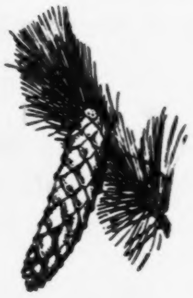
The Priest River extends 44 miles from the outlet at Priest Lake to Pend Oreille River. The Upper Priest River has its origin in Canada and drains an area the size of Rhode Island. It was famed as a western log drive stream in the first half of the century. Recorded drives started in 1901 and lasted until 1949. In 1949, low water caused many millions of board feet to be stranded on the sand bars and jam, where they rotted. Today the logs are hauled to the mills on modern logging trucks, a cheaper, more dependable, although less colorful, method of log transportation. "Wanegans", "River Rats", and "Bateaux", are now terms of the past.

13. Luby Bay

Turn right to Luby Bay (Hills Resort). In addition to picnicking, camping, swimming and other water sports, the Luby Bay Campground of the Kaniksu National Forest provides an opportunity for nature study, hiking and bird watching. Following is an example of the type of information given in a folder which is available at both Luby Bay and the Hanna Flats Nature Trails to help in identification of the trees, shrubs and wildflowers of the area:



RIBES *(Ribes spp.)* include several species of the gooseberry or current bush that grow in this area. Some have prickly stems and produce a red or black, round fruit about ¼ inch in diameter. Blister rust, the fungus that attacks western white pine, spends one stage of its life cycle on this plant.



WESTERN WHITE PINE *(Pinus monticola)* is an important timber tree. Its soft white wood is used extensively for inside finishing in building construction. Needles are 3 to 4 inches long and grow in bundles of five. Narrow cones are 5 to 12 inches long. A damaging fungus, blister rust, attacks western white pine and can eventually cause death or seriously deform the tree.

WOODPECKERS' DINING HALL was made by digging holes to get insect larvae for food.

The forests of this area are completely different from those in the central and southern portions of the state. The cool, moist climate produces a heavy growth of cedar, hemlock, white pine, Engelman spruce and lodgepole pine that forms a dense canopy. The floor of the forest is spongy and moss covered and in areas that have not been cleaned out there are many dead trees and rotting logs which provide ideal growing conditions for slime mold, mushrooms, and other fungi. In fact, the Priest River area has been used by Dr. Alexander Smith, noted authority on fungi, for study and collecting and is the scene of the annual Mycological Society meeting in the fall, (when fires don't ruin growing conditions.) Along a short portion of a typical trail such as in the Luby Bay area, a dozen or more different kinds of mushrooms can be discovered within 200 feet. **Don't pick the mushrooms; leave them for others to enjoy!**

14. Priest Lake State Forest

By walking down to the beach and looking across the lake one can see the Priest Lake State Forest. Established in 1950, it contains 193,251 acres and is the largest of Idaho's State Forests.

15. Priest Lake

Priest Lake itself is one of the three largest lakes in the Idaho Panhandle. In 1846, Father DeSmet named the lake Roothaan in honor of his Jesuit superior in Rome. Captain John Mullan, builder of the Mullan Road designated it on his 1865 maps as Lake "Kankisu", the Indian name for the Black Robes. Today the lake keeps it reference to the Jesuits in its present day name of "Priest" Lake.

It is 18½ miles long, averages 4 miles in width, has 63 miles of shoreline and is 41 square miles in area, with a maximum depth of 355 feet. There are seven islands on the lake. It is a very popular recreation attraction and the world's largest Mackinaw trout was caught here in 1963 (it weighed 54 pounds.) Large Dolly Varden trout are also produced and caught in the lake.

Upper Priest Lake is a smaller body of water connected with the main lake by a navigable channel called "The Thorofare". There are no roads to this lake and it can be reached only by boat.

16. Wood Rat Mine

The road south from Luby Bay leads by Hills Resort; just past this resort, a sign on the right hand side of the road points to "Wood Rat Trail". This path leads to the top of a hill overlooking the lake and Wood Rat Mine from which the path gets its name. The mine itself is right on the shore of the lake; in fact, a shaft extends under the lake. First opened up in 1905, and now owned by the Kaniksu Mining Company, the mine has yielded lead, silver and zinc along with smaller amounts of galena, chalcopyrite, pyrite, and quartz crystals.

Several other claims have been filed around the lake but there is little active mining in the area at present. The silver content is very low and few of the sites have been developed.

17. Hanna Flats Scenic Area

Return to Highway 57 and turn off the highway at the Hanna Flats Area sign. This 16 acre tract had the better white pine trees logged off 40 years ago. Some of the stumps and cull logs can still be seen. A severe forest fire swept past here across the road from the parking area. Since then the adjacent areas have been logged and replanted. This stand of trees has been set aside for study and demonstration and the trees will not be cut.

There is a nature trail and a brochure (same as at Luby Bay) here also – an excellent place to see the results of man's actions, both good and bad, on his environment.

18. Granite Creek Campground

Return to the highway and continue north. At Nordman a road leads to Reeder Bay on Priest Lake, where there are several resorts, campgrounds and private homes. The main road continues north and crosses Granite Creek after about 6 miles. Just past the bridge is the entrance to the Granite Creek Campground on the left. Follow this road to a dense growth of cedars with the flora typical of the Columbia Forest – spongy, moss-covered ground, thick canopy overhead and giant cedars rising high into the air. It is very similar to the type of forests found in Western Washington. These cedars may not be as old as the 800-year old Western Red Cedars in the Roosevelt Grove, a few miles to the north, but they are nevertheless quite impressive. This is almost on the Washington border. Return to Highway 57 and go back to Priest River on U.S. 195.

19. Thama Hill

Take U.S. 195 east towards Sandpoint. At the top of Thama Hill, about 4 miles east of Priest River, there is an impressive view of the broad Pend Oreille River.

20. Laclede

Four miles further is the tiny community of Laclede (population 150.) Indians traveling north and south through what is now the Idaho Panhandle used this point to cross the Pend Oreille River. There is a settlement on the south shore known as Seneacquoteen, which is the Indian word meaning "crossing of the waters". Evidence of the Indian encampments at this crossing can still be found along the shores in the form of arrowheads and other artifacts.

In the 1860's the Hudson Bay Company operated a trading post here. In 1864, when the first territorial legislature divided Idaho into four counties, Seneacquoteen became the county seat for Kootenai County. The courthouse was a log cabin used by early day trappers to store furs.

Here the highway joins the old Wildhorse Indian Trail and follows it to Sandpoint.

21. Sandpoint

Next stop is Sandpoint, county seat of Bonner County, located on Pend Oreille Lake.

Sandpoint is headquarters for the Kaniksu National Forest, and at the Sandpoint Seed Orchard on the west edge of town, geneticists are attempting to defeat the white pine blister rust disease. By tree selection and controlled pollination, they are developing a white pine tree with strong resistance to the fungus disease.

22. Lake Pend Oreille

Lake Pend Oreille is the largest lake in Idaho, covering an area of 148 square miles. Since the early 1880's it has played an important part in the settlement of northern Idaho, being the site of the first fur trading post in the northwest (David Thompson's Kullyspell House) and serving as the fastest route across Idaho into Montana. In the winter of 1886, promising mineral deposits (gold, silver, zinc and copper) were discovered in Granite Creek on the east side of the lake. This brought a heavy influx of people in the area and mines were opened at Lakeview, Talache, Hope and Clark Fork.

Bayview was a shipping point and ore was moved by barge from various points in the lake to the railroad shipping point at Hope.

Lime deposits were discovered in the vicinity of Bayview and Lakeview around 1890 and a thriving industry developed. The Washington Brick and Lime Works operated 5 kilns in Bayview and other firms shipped raw materials out for processing. Evidence of this industry can still be seen in the area. In 1910, a railroad spur was constructed at Bayview. Railroad cars on barges were loaded with limestone at the cement plant at Lakeview, and towed to Bayview where they were transferred directly to the rail line for shipment to Spokane. Mining activities came to a standstill in 1929 and the lime business died away in the late 1930's.

Continue south on U.S. 95.

23. Long Bridge

The causeway leading to Long Bridge is located on the sand spit or "Point of Sand" noted by David Thompson in 1809. The present highway bridge, built in 1957, replaced a wooden bridge which was located to the west. Two miles long, it was the longest wooden bridge in the world.

24. Osprey Nest.

At the south end of the bridge, on the right, is an osprey nest. It has been a nesting place for many years. Every year the male returns in the spring, repairs the nest and two weeks to the day after his arrival, his mate appears on the scene.

The osprey is a fish hawk but it hardly fits the popular conception of a savage hawk, despite its huge size. Small birds of several species nest unmolested in the crevices of the osprey's castle. Except in the defense of nest and young, they live peaceably and seem concerned only with catching enough fish to eat. Flapping along fifty feet or more above the water, the bird spots a fish fairly near the surface, closes its wings, plunges head first and hits the water with such momentum that it often goes out of sight, but it seldom comes up without a fish in its talons.

25. Kaniksu Batholith

Look for outcrops of the Kaniksu Batholith rocks, which are over 100 millions years old, in road cuts along the highway.

26. Round Lake State Park

Located eight miles south of Sandpoint and two miles west of U.S. 95, the area contains approximately 35 camping sites located on the shores of Little Round Lake.

The vegetation is typical of that found in North Idaho, a mixture of coniferous species such as white pine, Douglas fir, western larch, cedar and hemlock. The lake itself is rather small, but is a good place to study pond life and observe ecological relationships.

27. Cocolalla Lake

Two miles further south is Cocolalla Lake right next to the highway.

28. Community of Granite

A few miles further on is the tiny community of Granite, one mile west of the highway. It owes its existence to the railroad, because the large rock quarry near here provided granite as a base for the road bed.

The small canyon at the base of the hill is believed to be the channel of the original outlet for the waters of Lake Pend Oreille after the last glacier retreated up the Purcell Trench. This channel, which reached the Pend Oreille River at Seneacquoteen, was abandoned when the lake waters cut a new channel in the vicinity of Sandpoint.

In December 1961, a passenger train jumped the tracks and the engine plunged into Granite Lake, killing the engineer and fireman. In 1964, the Northern Pacific Railroad began a four million dollar construction project to eliminate a tunnel, a trestle and several bad curves, resulting in a shorter, safer trip and eliminating a section of track that has been an engineering problem ever since the railroad was built here 87 years ago. The town at one time supported two sawmills but today there is no industry.

29. Granite Plantation

Return to the highway and continue to the sign pointing to the "Granite Plantation", two miles west of the highway. This stand is an excellent example of the results of pruning a natural stand of Douglas fir and ponderosa pine.

When goatweed became a major problem in 1956, goatweed beetles were imported into the area and successfully controlled the goatweed. The area is still being observed to determine long range accomplishment.

Just another mile or two and the road reaches Athol. Return to Farragut State Park and the circle is completed.

BONNER COUNTY – SANDPOINT EAST

Take U.S. 10A east from Sandpoint. Just after passing Sunnyside Mountain on the right, the highway crosses the Pack River Flats where the Pack River has formed a delta as it enters the lake. Watch for waterbirds and other wildlife.

TRESTLE CREEK

A few miles further on is Trestle Creek. This area is a rather limited valley containing some flat ground and an old homestead. The primary attraction is Trestle Creek itself, an excellent example of an unpolluted mountain stream.

This is a popular camping, huckleberrying and fishing site. However, don't let the emphasis on recreation obscure the educational value of such places. Wherever there is good fishing and camping, there are also opportunities for nature study and exploration into an unknown environment – make use of these opportunities! Syringa bushes are thick along here. Other vegetation ranges from grassland in the valley floor (very limited) to typical north Idaho timber.

HOPE FAULT

Continuing on, the road approaches the Hope Fault zone, a complex of branching faults striking northwest. The northeast side has moved an estimated 10-16 miles southeast, and the vertical displacement of the two opposite sides of the zone is believed to range from 5,000 to 16,000 feet. Locally the actual width is as much as 5 miles. It goes right through Hope.

KULLYSPELL HOUSE

The David Thompson Game Preserve to the right after passing East Hope contains the site of the Kullyspell House, established by Thompson in 1809. Nothing remains of the structure, however.

Another interesting feature is the Indian paintings located on a rock face between Sheepherder's Point and the Denton Slough. The paintings are of unknown origin, but are located in a favorite camping area of the Indians and are on the main Indian trail between David Thompson's Trading Post and Thompson Falls. There is no road to the area, however, an approximate 2½-mile trail from the county road past Samowen Campground joins the location. The jeep trail which leads to the paintings is not open to vehicle traffic, but it may be followed on foot. The paintings are back about 50 yards from the main point of land, facing southeast on a rock face. They are also accessible by boat.

GLACIAL SCRATCHES

Roadcuts along here have been showing metamorphic rock of the Precambrian Belt Series – argillites, siltites, quartzites and dolomites; these began accumulating over one billion years ago. Glacial scratches and grooves in the bedrock can be seen along here – above cliffs at the Denton Curve, and also on the first sizable roadside cliff after leaving Clarkfork (about ¾ mile). Glacial ice may have been close to 3,000 feet thick in this region.

Howe Mountain to the north as well as Antelope Mountain and Sugarloaf Mountain to the southeast are small fault blocks caught in the main Hope Fault zone.

To the right of the highway, note the delta built by the Clark Fork River as it enters Lake Pend Oreille; sand bars, oxbow lakes and marshy channels show that the river is approaching old age; the delta is still growing.

WHITEDELPH MINE

A sign on the left points to the road leading to the State Fish Hatchery, which is open to visitors. This road goes by the Whitedelph (Whitedelf) Mine (about 0.7 mile south of the hatchery) on the east flank of Howe Mountain. Historically it is the largest producer of silver in the Clark Fork District. First mined in 1924, it is now idle. The principal mineral is galena found in limy, grayish-green, shaly siltite and quartzite.

LIGHTNING CREEK

The same road goes up Lightning Creek. In 1959, the Army Engineers completed a 4,000-foot long levee at a cost of $42,000 on the east bank of the creek to prevent flooding in the town of Clark Fork, which borders it.

On the other side of the creek, a road leads from Clark Fork north up the typical U-shaped glacial valley of Lightning Creek. Look for other evidences of glacial action in this area.

Another mine, the Hope, is located about a mile north of Clark Fork on the east side of Lightning Creek. Started in the 1920's, it produced silver ore until 1944, but most of the equipment has been removed from the site and caving and flooding has sealed off much of the mine so that it is inaccessible.

East of Clark Fork up Mosquito Creek is the Lawrence Mine, quite similar to the Whitedelph and Hope Mines, although it is much older, first shipping ore in 1903. It has also been idle since the 1940's. There are many other mines in the area which in the past produced principally gold, silver, copper and lead, but most are now abandoned.

CABINET GORGE

Continuing east, U.S. 10A follows the Clark Fork River, which now exhibits characteristics of maturity, on up through Cabinet Gorge where the river is still downcutting through the resisting argillites, a sign of late youth. The name "Cabinet" refers to the box-like formations in the canyon. The gorge itself is not visible from the highway. Just east of the gorge is the Idaho-Montana line.

WATERSHED PROJECT

A few miles into Montana, a bridge crosses the river to join a road which follows the south side of the reservoir. This road can be followed back into Idaho to opposite Clark Fork, where the river can be crossed again to rejoin U.S. 10A; or a Forest Service Road (No. 278) can be taken southwest up Johnson Creek to the Tom's Gulch Watershed Project of the Kaniksu National Forest. Three miles past Johnson's Divide, at the left hand fork, a road sign indicates Tom's Gulch Road. The watershed project is located 1½ miles past this sign. The area is approximately ½ mile past the Johnson Cabin Trail 606 sign. This project consists of stream channel improvement with 14 log diversion walls and 5 log water drop structures.

This winding and twisting road (Forest Service Road No. 278) continues west and skirts the southeastern edge of Lake Pend Oreille to the Lakeview area where there were once many active mines.

MINES

South of Lakeview, a road up Gold Creek leads past the old Conjecture Mine, New Rainbow Mine and, 6 miles from town, the Weber open pit silver mine, the only active mine in the area. Mine dumps often yield interesting minerals such as quartz, magnetite, pyrite, chalcopyrite, and galena. However, hidden mine shafts post a hazard, and **shafts should never be entered!**

Marine fossils of Cambrian Age are also found along lower Gold Creek.

BERNARD PEAK LOOKOUT

A road from here joins Bunco Road which goes west past Prospect Peak and Bernard Peak; Bernard Peak can also be reached by taking Forest Service Road No. 278. This is one of the 21 fire lookouts in the Kaniksu National Forest. Manned from late June until mid-September, it is open to visitors. This is the ideal place to conclude a tour of Bonner County, for from here can be seen Lake Pend Oreille to the north; the peaks, ridges and folds of the Cabinet and Selkirk Mountains to the north and east; the eroded Coeur d'Alene Plateau to the southeast; glaciated Purcell Trench to the northwest; and the Rathdrum Prairie and Spokane Valley to the west and southwest.

This road joins State Highway 54, 1½ miles west of Farragut.

KOOTENAI – SHOSHONE COUNTIES

Some of the most beautiful scenery in Idaho – and some of the most dismal – can be seen in these two counties. The beautiful Coeur d'Alene and Hayden Lakes and lovely forests contrast markedly with the scarred hillsides and polluted streams of the nearby mining district.

There are many excellent examples here that can be used educationally to show man's effect on his environment, the effect of the environment on economic development of an area, and how all the factors of our environment are inter-related.

COEUR D'ALENE

The town of Coeur d'Alene, which was named for the tribe of Coeur d'Alene Indians, lies on a terminal moraine deposited by one of the continental glaciers. Coeur d'Alene has many interesting resources that can be used as outdoor classrooms.

TUBBS HILL

Tubbs Hills, which is to be developed into a city park, borders the lake, and rises 400 feet above the town. The Idaho Water Company has a pumping station at the foot of the hill which pumps water to a million gallon tank near the top of the hill for use by the city.

Along the trail which winds around the hill, many different kinds of plants, small animals and birds can be seen. The rock formations here are entirely different from any in the immediate surroundings, suggesting that they were brought here by glacial action. The view of the lake and city is outstanding from here.

FLOOD CONTROL

On the western edge of the city, look for evidences of flood control in the form of levees and flood walls constructed along the Spokane River and the lake. Flooding was frequent before these flood control measures were completed in 1941.

The Idaho Fish and Game Department is well worth visiting. Head mounts of antelope and mountain goat, a whole mount of a mountain goat kid and the pelts of different animals can be seen here. Slides are also available for viewing at the Department or visits will be made to the classroom. (Phone MO-9236 to make arrangements – see study trip guide).

COEUR D'ALENE NATIONAL FOREST

Two miles northwest of the city is the U.S. Forest Service Coeur d'Alene Nursery established in 1960 to produce seedlings for reforesting cut-over and burned forest land. It is one of the most modern in the world. Guided tours through the entire nursery show how the cones are dried, seeds extracted and planted, and how young trees are prepared for shipping. Open between 8 am and 5 pm on weekdays, visits can be arranged by calling MO4-5571 (see study trip guide).

On the east edge of Coeur d'Alene is the Forest Supervisor's office and the Fernan Ranger Station of the Coeur d'Alene National Forest. A weather station is located here and personnel are available to guide and discuss all phases of forestry operations. (See study trip guide.)

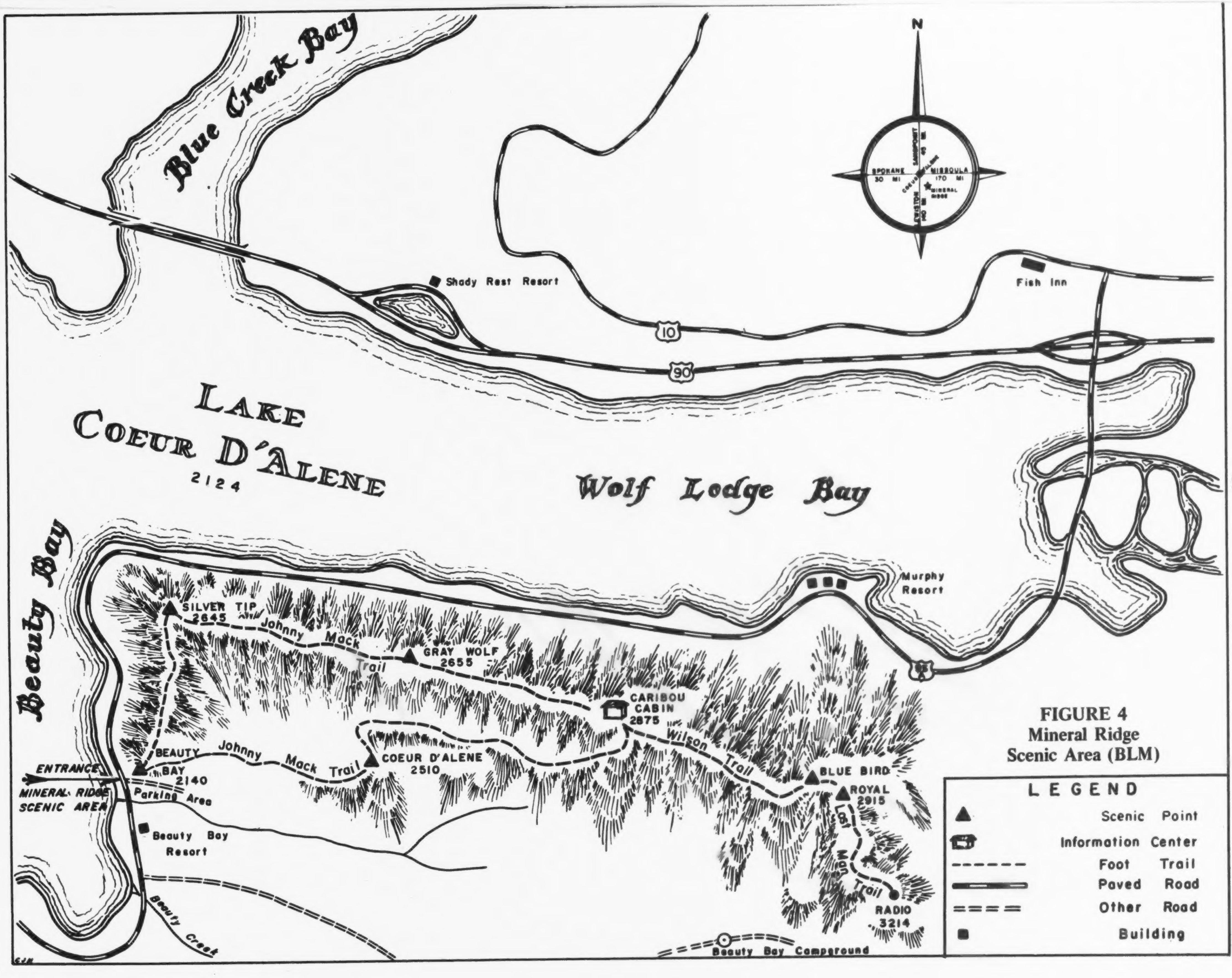

Blue Creek Bay
N
SANDPOINT 40 MI
SPOKANE 30 MI
MISSOULA 170 MI
COEUR D'ALENE
MINERAL RIDGE
LEWISTON 140 MI
Shady Rest Resort
Fish Inn
10
90
LAKE
COEUR D'ALENE
2124
Wolf Lodge Bay
Beauty Bay
Murphy Resort
SILVER TIP 2645
Johnny Mack Trail
GRAY WOLF 2655
CARIBOU CABIN 2875
Wilson Trail
BLUE BIRD
ROYAL 2915
Lost Man Trail
RADIO 3214
BEAUTY BAY 2140
Johnny Mack Trail
COEUR D'ALENE 2510
ENTRANCE
MINERAL RIDGE SCENIC AREA
Parking Area
Beauty Bay Resort
Beauty Creek
Beauty Bay Campground
LEGEND
▲ Scenic Point
Information Center
Foot Trail
Paved Road
Other Road
■ Building

FIGURE 4
Mineral Ridge
Scenic Area (BLM)

FERNAN LAKE

Fernan Lake is also an excellent area for observing song birds such as red-winged blackbirds, yellow-headed blackbirds, and grosbeaks. In addition reptiles and amphibians such as rubber boa snakes and blue-tailed skinks may be found here. Vorticella can be obtained for classroom use by scraping slime from the bottom of decayed lily pads. Large paramecium have also been cultivated from the water of this lake.

U.S. 10 west from Coeur d'Alene follows along the Spokane River which marks the southernmost edge of the Rathdrum Prairie. Piles of stones along fences and rocks seen in gravel pits and highway cuts are evidences of the glacial origin of this plain.

POST FALLS

Nine miles west of Coeur d'Alene is the Post Falls dam. The dam can be reached by turning south at the signal light in Post Falls and following the signs about ½ mile to the falls, where there is a small parking area and viewpoint. When the flow of water through the side section of the dam is reduced, the rock formations that formed the original falls can be clearly seen. These are unusual step-like blocks with flat surfaces and square faces. The Washington Water Power Company power plant is usually open to visitors and, though fairly small, is exceptionally good for elementary students to visit.

On the way back to the highway, turn north at the first junction past the railroad and go about 1 block. A dirt road to the west leads to Treaty Rock, where Frederick Post, the founder of Post Falls, carved his name and the date, June 1, 1871, as a treaty with the Indians for water rights for his grist mill and sawmill. It is advisable to leave cars or busses here and walk to the rock which is only a few hundred feet to the west, on the south side of a small hill. There are no signs to the rock. Local inquiry might reveal additional interesting historical facts.

MINERAL RIDGE SCENIC AREA

East of Coeur d'Alene are also many worthwhile areas which can be visited. One of the best for nature study is the Mineral Ridge Scenic Area, developed by the BLM. Take the Harrison exit from Interstate 90, 7 miles east of Coeur d'Alene and go south for 2 miles on U.S. 95A (see map, Figure 4). Over 50 specimens of trees, grasses, shrubs, and mosses are identified and marked along a nature trail. Historical information is also provided on signs along the trail, and a brochure with a map and description of the history and the flora and fauna of the area is provided at the entrance. There are rest benches, drinking water and restrooms near the parking area and at some of the viewpoints along the trail. This is a great place for students to engage in physical activity, learn about the outdoors, and absorb some history all at the same time. (Contact the Coeur d'Alene District BLM Office, Coeur d'Alene, for copies of the brochure or more information.)

To the southwest is Beauty Bay, the most scenic and frequently photographed segment of Coeur d'Alene Lake. About one mile from Mineral Ridge is Beauty Creek campground, which has camping and picnicking facilities. Many old mines are located on Beauty Creek Road to the south. Mining operations have been resumed in one area and a small smelter is being built. **Do not enter old mine shafts and obey No Trespassing signs!** Mine dumps, however, often harbor interesting rock specimens and reveal a great deal about the geology of an area. These usually can be explored without danger.

Beauty Bay on Lake Coeur d'Alene (Courtesy Idaho Department of Commerce & Development)

HISTORIC SITES

Returning to Interstate 90, a visit can be made to the historic John Mullan tree. A sign marks the turnoff on the north side of the road at the Fourth of July Summit (14 miles east of Coeur d'Alene). It was here on July 4, 1861, that Captain John Mullan and his men camped while building the Mullan road (which was later to become U.S. Highway 10 and Interstate 90). They raised an American flag on top of the tallest white pine to commemorate the day, thus, the name of the summit.

Six miles further east is the Cataldo Mission, the oldest building in Idaho, which sits on a hill to the south of the highway. The structure was built in 1848 by Father Ravalli, a Jesuit Priest, with the help of unskilled Indians. Situated above the Mission Flats of the Coeur d'Alene River, it is evidence of how constructive man can be. Surrounding the white building, piles of dredged sand and dirt and the polluted greenish-white water of the Coeur d'Alene River are mute evidence of his destructive powers. Note results of the dredging and other mining operations as the road enters the canyon beyond this point.

QUESTIONS ON POLLUTION

Suggested questions for discussion of man's effect on his environment:

What evidence is there of air pollution as well as water pollution?

Is there any way to remove mineral resources from the land without scarring the earth and polluting the streams? Is man's technology limited to removing, not improving? Must a beautiful environment be sacrificed for economic development?

What steps might be taken to rehabilitate these areas? What could be done to prevent further destruction of streams and vegetation?

COEUR d'ALENE MINING DISTRICT

This is one of the richest mining districts in the world and contributes heavily to Idaho's economy. Though it was developed later than most of the gold rush areas of the state, it has been a leading producer of gold, silver, lead and zinc since 1884. Much of this ore has come from veins in underground mines thousands of feet deep.

The entire area between Coeur d'Alene and the Montana border has been extensively faulted and folded; horizontal movement along the main Osburn Fault – which the highway and river follow – may be as much as 16 miles. Faults, folds, and scarps are visible in many places in this area.

Although precious metals occur in lodes in quartz veins in the metamorphic rocks of the Belt Series, placer deposits in unconsolidated sand, silt, and gravel have also produced millions of dollars worth of gold and silver.

Many of the surface plants are open to visitors, although only in special cases can underground tours be arranged. The famous Sunshine Mine, 2 miles southeast of Kellogg (up Big Creek), the largest silver mine in the world, allows visitors at the plant. The Bunker Hill lead smelter is also open to visitors. Hecla's Lucky Friday Mine at Mullan and the Star Mine at Burke have tours of surface plants (see study trip guides). Arrangements can probably be made with other mines for visits also.

While visiting the mines, find out what attempts are being made to cut down on air and water pollution (settling ponds, dust filters, etc.). What are the main problems faced by industry in disposing of its waste? Are there reasons for solving these problems and preventing such pollution other than for the appearance of the environment – just to make things look nicer? Could there be any economic values? Any benefit to health?

Presently, most if not all of the mining companies have constructed settling ponds to remove mine and/or mill wastes which could give the river its gray color. These ponds have not yet been put into use; one reason commonly given is that the industrial wastes neutralize the raw human sewage dumped into the river throughout the valley. This problem was given special attention by the State Board of Health as described in the following article which appeared in the Statesman Newspaper, August 16, 1968:

> *"Members of the State Board of Health, Friday personally posted the first of a number of signs warning that the South Fork of Idaho's Coeur d'Alene River is dangerously polluted.*
>
> *"The signs, to be scattered along 32 miles of the river from Smelterville to Mullan, read: Danger, unsafe water, contains raw human sewage. Penalty if removed. Idaho Department of Health.*
>
> *"The board said it will conduct a formal public hearing at which the Shoshone County Commissioners and officials of other governing bodies in the area will be asked to explain why they have not abated pollution in the river.*
>
> *"A sewer district was formed in the area some time ago but attempts to gain approval of a bond issue to finance construction of a sewage disposal system have been unsuccessful.*
>
> *"The board was told by Vaughn Anderson, director of the State Health Deparmtment's division of engineering and sanitation, that, contrary to popular belief, the contamination is not reduced by the presence in the river of mine tailings . . . the main course of the South Fork, Coeur d'Alene River, shows heavy contamination with sewage bacteria and there is no evidence that these concentrations are reduced by the presence of mine tailings.*
>
> *"(Mine) representatives told the board that they will remove tailings from the stream before the end of the summer."*

POLLUTION OF STREAMS

While observing the polluted streams remember that the Coeur d'Alene River flows into Lake Coeur d'Alene which serves as a source of drinking water for the people in the City of Coeur d'Alene, and is used for swimming and boating by thousands each year. What responsibility do the people who live upstream have to those who live downstream? An investigation into the State Board of Health regulations concerning disposal of wastes –industrial, domestic and agricultural – and water quality standards would make a good student project, for the problem of pollution is not confined to this area only; it must be faced by water users all over the state.

MINERALS

This area is a rock hunter's paradise with excellent specimens of galena, pyrite, milky quartz, white quartzite (some with manganese dendrites found in upper Burke Canyon), chalcopyrite, schists, calcite and other minerals found throughout the district.*

---

*Contact Mrs. Kathryn Gyde, Wallace Junior High School, Wallace, Idaho, if you are interested in trading fossils or unique rocks from your area for mineral specimens from the mining district.

Continue east beyond the mines until you find the Coeur d'Alene River in its clear and natural state, and until you begin to climb over Lookout Pass. Take the first road to the left after you begin to climb, and follow it until you reach a park. This park, referred to locally as Potsville, is a fine place to enjoy a picnic lunch. Water, campfire and restroom facilities are available. Continue along the road until you reach the State Fish Hatchery (end of the main road). A visit here can be very informative.

This area has survived many catastrophes. Burke Canyon has been the scene of disastrous snow slides; flooding often damages property; fires have destroyed not only forests but entire towns. Man has matched nature's destructiveness with recurrent strikes and feuds which took the lives of many.

Over a thousand men were arrested and put in a "Bull Pen" in 1899, following a strike in Kellogg, and Governor Steunenberg placed the area under martial law for more than a year. Six years later when he was no longer governor, he was blown to bits by a homemade bomb near his home in Caldwell. Although occasional strikes continue, the violence of the early days of unionism has disappeared. An area rich in history as well as minerals, this is well worth a visit.

The town of Wallace maintains a mining museum. Brochures and information can be obtained from the Chambers of Commerce in both Wallace and Kellogg.

BURKE CANYON

A very interesting side trip can be taken up the Burke Canyon. As you are driving through Wallace toward Mullan, turn left at the Conoco station (east side of town) and cross the railroad tracks. As you travel up the canyon, you will notice remnants of the gold and silver "boom mining" days. The towns of Gem and Burke are nearly ghost towns; they reportedly had as many as 10,000 inhabitants during the gold rush of the late 1800's. Burke has been included in "Ripley's Believe-it-or-not" series because it was the only town in the world with the river, railroad tracks and road all passing through the same place. The town is limited to a narrow lane for traffic, railway and waterway because the valley is so narrow. These mountains have been a source of avalanches, one of which obliterated the small community of Mace in the 1950's.

SCENIC LOOP

From Wallace, travel south up Nine-mile Canyon. You will pass the Dayrock Mine and Mill on the left. Follow signs toward Prichard and Enaville, where you will return to Highway 10 or Interstate 90 a few miles west of Kellogg. The scenery on this trip is typical of northern Idaho mountains. If you travel to Prichard and Murray you can view near-ghost towns. Wyatt Earp and other colorful Old West figures reportedly visited this area during the Gold Rush days. Logging and saw mill operations can be seen here, as well as many species of big game animals. (Local inquiry can be extremely valuable here.)

A BOAT TRIP ON THE SHADOWY ST. JOE RIVER

One of Idaho's most important natural resources is water. Besides the obvious uses for domestic purposes, irrigation, industry and recreation, the many lakes, streams, and rivers can also be used educationally. Every part of the state has its unique water resources: lakes, rivers, small streams and reservoirs. This water not only can be studied or observed from the shore but in many places can also be used for transportation, so here is a field trip by boat. While specifically describing one river – the St. Joe – this should serve as an example of what might be observed or studied along any river or on any lake shore.

Specific mileage will not be given but reference to topographic, Forest Service or county maps will help in identification and location of features mentioned (see maps, figures 6 & 7).

UNIQUE FEATURES

The St. Joe River is unique in several ways. It not only is the country's highest navigable stream, but it is a river which keeps its identity as it flows through a lake. Enough of a curiosity to be featured by "Believe-it-or-not" Ripley, it flows between natural levees which support a dense growth of mature trees – right through a portion of Lake Coeur d'Alene. One of the advantages of a boat trip is that even with a motor travel is slower so observation is easier. Also, such features as meanders not only can be seen but can be experienced due to the force exerted as the boat goes around the curves.

A boat trip on the St. Joe offers much in the way of both botanical and zoological interest. Obviously the aspect changes with the seasons. Furthermore, from a boat, the broader aspects of the vegetation are more evident, although identification of trees and shrubs may be possible only when they are in flower.

Because of the slight drop in elevation along the lower part of the river, the current moves slowly and the surface is as smooth as glass – hence, the name – the shadowy St. Joe. Reflections of the bordering trees along the levees and the mountains in the distance are mirror perfect.

FLOODING

In the vicinity of St. Maries, the levees are all man made, built to contain the river during times of high water in the spring. When the snow melts in the mountains, the St. Joe overflows its banks (where not protected by levees) and in times past the water has covered the flatlands from hill to hill. The worst flood in history of the St. Joe Valley occurred in December, 1933; railroad tracks were under six feet of water, livestock drowned, all the families along the river had to leave their homes and in many cases, their houses were washed down the river. Dikes were destroyed and the entire St. Joe Valley became one vast lake. In 1942, the Army Engineers completed a system of levees and flood walls that prevents an estimated $50,000 damage each year. This, plus construction of other levees and installation of pumps, permits use of the fertile flood plain for agriculture and roads, but there is still danger from flooding.

ST. MARIES

Although boats can start from any point on Lake Coeur d'Alene, and reach the St. Joe River, this description will start at St. Maries (population 2,435), the county seat of Benewah County. Starting

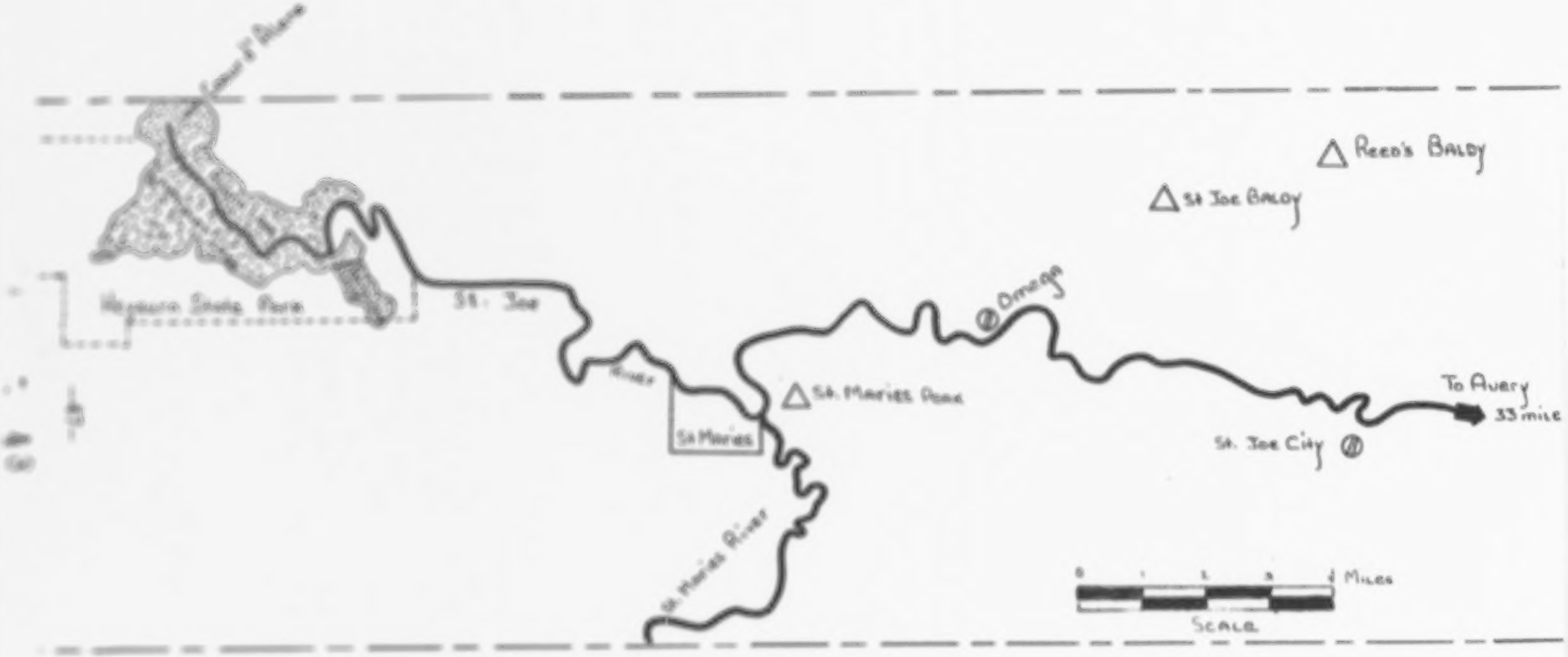

Coeur d' Alene
Heyburn State Park
St. Joe
River
St Maries
St. Maries River
St. Maries Peak
Omega
St Joe Baldy
Reed's Baldy
St. Joe City
To Avery
33 mile
0
1
2
3
4 Miles
Scale

FIGURE 6
St. Joe River

at the river, unloading stations for logs can be seen on the right; trucks drive up to these and release entire loads of logs, banded together, into the river, where they are later hooked onto tugs and taken downriver to mills; watch for these tugs with boom logs trailing behind as they go up river for a load, or as they tow loads – called brails – downstream. Also on the right are the remains of the old city docks.

A boardwalk nearly ½ mile long ran along the river front and across the St. Maries River to the opposite hillside. It was here that the larger boats which brought supplies and passengers from Coeur d'Alene unloaded – often as many as six at a time would be tied up here. A favorite form of entertainment on Sunday afternoon was going to the boardwalk to watch the excursion boats come in. Large steam boats came to St. Maries from Coeur d'Alene on a regular schedule as late as the 1930's. In fact, the rivers were the first highways in this region and in addition to the steamers, rafts and rowboats were used to haul all the supplies needed for development of farms and settlements. In the winter, the river was often frozen over or blocked by ice for five or six months. Mail was delivered upriver on skates. Sleighs were sometimes used, but such trips were perilous.

Straight ahead is St. Maries Peak, elevation 2,560 feet. Just at its base, coming in from the south, is the St. Maries River (also navigable at this point) which joins the St. Joe. Within the first mile of leaving St. Maries the boat has already come around a complete meander which brings it to a point directly north of the starting point; at times one has the sensation of going in circles, which is almost true.

VEGETATION

The dominant woody forms, obviously adapted to the conditions of high soil moisture along the banks, are black cottonwoods (*Populus trichocarpa*), willow (*Salix*), birch (*Betula*) and alder (*Alnus*). In late June the surface of the water is white with the tufts of cotton from the female (pistillate) cottonwood trees. Some of the cottony tufts contain a weevil which is fed on by fish.

On the slopes of the hills adjacent to the river, it is possible to recognize, particularly during their flowering period, the following: thimbleberry, serviceberry, wildcherry, oceanspray, mountain ash, ninebark, snowberry, and syringa.

MT. BALDY

Watch for the first view of Mt. Baldy (St. Joe Baldy), a 5,825-foot peak about 8 miles northeast of St. Maries. When heading northeast on one of the loops of a meander it appears straight ahead and its reflection can be seen in the river. There is a forest service lookout on the top which can be reached by a winding road from the road which follows along north of the river. This river road is not visible from the boat for the first few miles after leaving St. Maries because it is on the other side of the levee, but about 5 miles upstream, the levees end and views of the road can occasionally be seen across meadows bordering the river.

Two miles east of St. Joe Baldy is East Baldy (Reed's Baldy), an even higher peak (6,153 feet), with tiny Crystal Lake on its west side. Notice the difference in vegetation between the two peaks. What factors might account for this?

RIVER BANKS

Between St. Maries and the small settlement of St. Joe, the banks of the river are quite low with

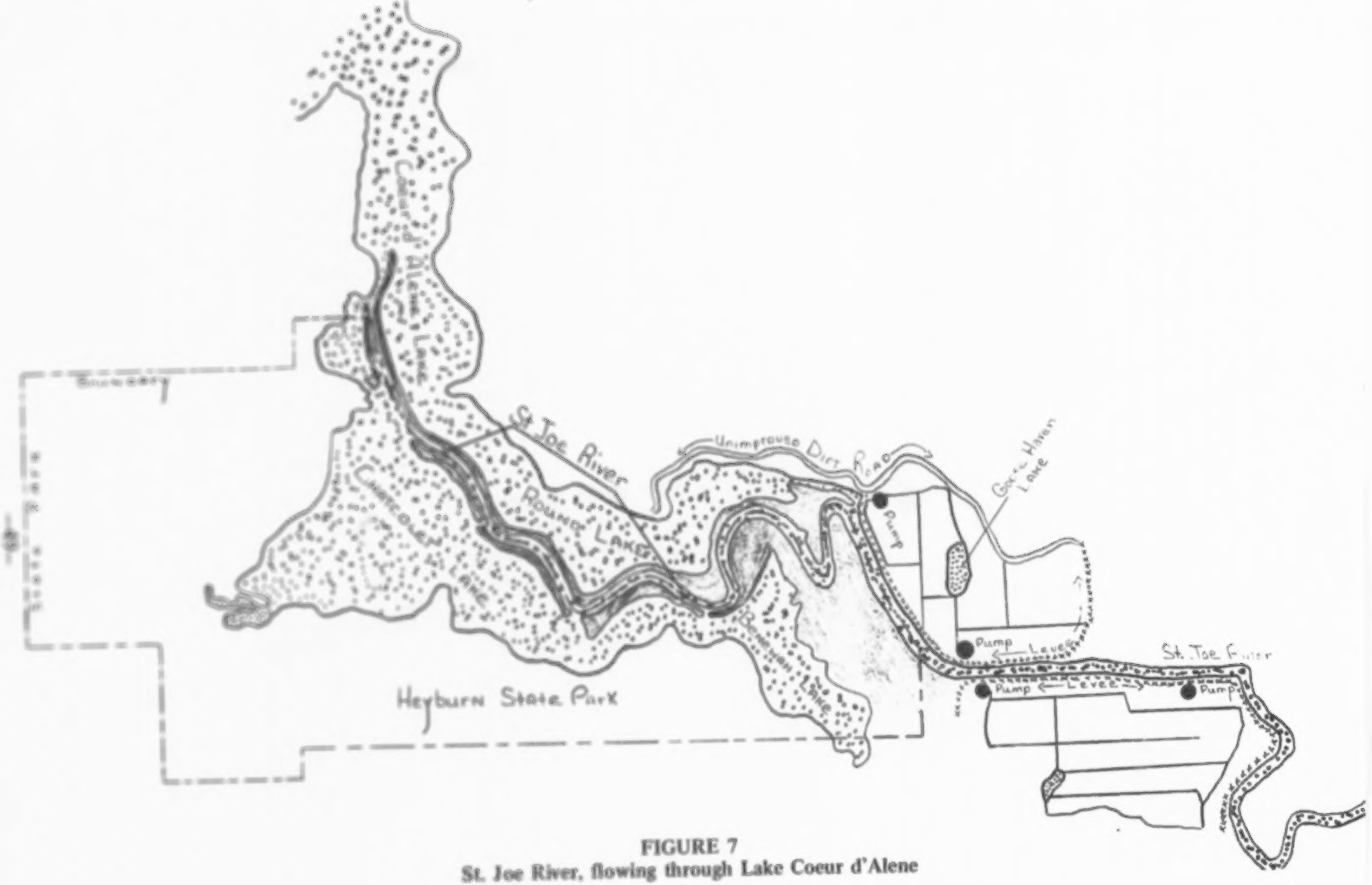

Coeur d'Alene Lake
St Joe River
Unimproved Dirt Road
Goose Haven Lake
Pump
Pump
Levee
Pump
Levee
Pump
St. Joe River
Round Lake
Chatcolet Lake
Benewah Lake
Heyburn State Park
Boundary

FIGURE 7
St. Joe River, flowing through Lake Coeur d'Alene

0
1
2
3
4 miles

adjacent and sometimes rather extensive meadows apparent. These are subject to flooding in the spring when the river is at its peak. The vegetation on the meadows is very lush and consists of a rich flora of grasses, forbs, and some shrubs and scattered trees. It is easy to see why the early Swiss settlers developed dairy farms along here. Cows still graze in the meadows, primarily on the north side as there is no road along the south and no bridge across the river between the towns of St. Maries and St. Joe, a distance of over 10 miles. Transportation to farms on the south banks is by private ferries or boats.

In other places along the river, particularly along the bends, the bank consists of precipitous rock cliffs often rather well covered with vegetation but always exhibiting evidence of the abundant moisture which characterizes the area in the winter and spring.

VEGETATION ZONES*

On the higher ground back from the river is a diversity of tree species. This raises the question as to what vegetation zone is represented in the area adjacent to the St. Joe.

Effect of Fire

The finding of the answer to this question is complicated by several factors. First, the area has been ravaged by fire. In 1910 much of the region was destroyed by perhaps the most extensive forest fires ever to hit the Northern Rockies in historic times. Eighty-five lives were lost, five towns ruined and millions of acres of timber destroyed. The evidence of smaller, more recent fires is attested in some areas by rather extensive patches of shrubs and in others by stands of young trees dotted by old snags. The vegetation in the recent burns is characterized by successional species and offers little clue to the type of plants which will eventually take over and constitute the stable, more or less permanent forest.

Slope and Soil

A second group of factors complicating the problem of classifying the area as to plant zonation is the local variation in steepness of slope, amount and type of soil, and direction of slope which in turn influences light, temperature and soil moisture. Compare the north facing and south facing slopes as to density of vegetation and as to tree species. Which conifers are evidently more xerophytic (drought enduring)?

On some of the obviously drier south facing slopes, there is a predominance of ponderosa pine. This species also may be looked for in areas with shallow, rocky soil. Its seedlings cannot tolerate deep shade so they cannot compete with other conifers on the more moist north slopes. The Douglas fir zone is the next most xeric forest type in northern Idaho. However, along the St. Joe, one rarely finds pure stands of this tree. It may occur with ponderosa pine which it might be slowly replacing or it may be associated with grand fir, western hemlock, western red cedar, or such species as larch (tamarack), lodgepole pine, and western white pine. What factors determine which species will re-populate an area after a fire?

The size of the fire, which determines the severity of alteration of the environment, is one important factor. The occurrence of stands of lodgepole pine or larch or a mixture of the two usually indicates a sequence of rather severe fires, whereas an area dominated with nearly a pure stand of western white pine suggests longer intervals between fires.

---

*Information regarding vegetation contributed by Dr. Alvin Aller, Department of Biological Sciences, University of Idaho, Moscow, Idaho.

Elevation

A third major factor with a bearing on zonation is elevation. The cedar-hemlock zone normally should be expected to occur at a higher elevation than the Douglas fir zone, in an area with cooler temperatures and greater moisture. There are other plant zones to be found at higher elevations in the Rocky Mountains, however, the relief along the St. Joe River is not very great. St. Maries has an elevation of approximately 2,400 feet and Mt. Baldy to the northeast is 3,900 feet higher. The changes in vegetation on the slopes of Mt. Baldy are not to be attributed entirely to elevation, however, for fire, logging, and soil conditions play important roles in determining what plant species are found there.

Watch for evidence of lumbering and management. Is there any evidence of disease or wind damage in the timber on the hillsides?

ANIMALS AND BIRDS

Bear, deer, and elk are abundant both along the river and in the hills. Although water birds are not abundant, ducks, sandpipers, and song birds are numerous. Bass, trout, kokanee and crappies make this a popular fishing stream.

Although not visible from the boat unless the river is quite high, there are many lakes bordering the river just beyond the banks. Some of these may be cut-off meanders though they don't show the typical oxbow shapes.

OMEGA CHURCH

About 6 miles upstream is a small white church on the north bank, facing the river. This is Omega Church, where services are still held three times a week. It would be interesting to know the background of the building. Might there also have been a school here at one time? This area is rich in history, as is any part of the state. Talking to oldtime residents will often reveal a great deal of interesting information. The book **Steamboats in the Timber** interestingly covers the early history of Coeur d'Alene and the St. Joe and St. Maries Rivers.*

CREEKS

Notice the creeks which empty into the river from both sides. What kind of wildlife might be found along these? Would these creeks be good for fishing? Why? Look for evidences of high water. What time of year would the river be the highest? Try to find out how much the level varies during the year.

Visible from the river are growths of cedar and hemlock; sometimes constituting a rather well defined zone above the Douglas fir zone, these may frequently be found at low elevations where they indicate cool, moist conditions due to local topography or other factors. These slopes were at one time thickly covered with huckleberry bushes and the Indians came up the river each summer on berrying trips.

Two interesting shrub species, the yew and Devil's club are also commonly found in the meadows and forested slopes. Many smaller shrubs and species of ferns as well as a host of herbaceous species are characteristic of this zone. Below is a list of some of the most typical subordinate species of the cedar-hemlock forest.

***Steamboats in the Timber**, by Ruby El Hult, Caxton Printers c.1952.

Early Spring Plants:

Coptis occidentalis (gold thread)
Trillium ovatum (white trillium)
Calypso bulbosa (lady slipper)
Fritillaria lanceolata (riceroot)
Clintonia uniflora

Late Spring Flowers:

Tiarella unifoliata (foam flower)
Linnaea borealis (twin flower)
Chimaphila umbellata (prince's pine)
Pyrola sp. (wintergreen)
Ribes sp. (currants and gooseberries)

Ferns:

Athyrium filix-foemina (lady fern)
Dryopteris sp. (shield fern)

Trillium (Photo courtesy Bob Lorimer)

ST. JOE CITY

When the first bridge across the river is reached, a distance of 16 miles has been covered by boat, though this is only 9 miles east of the starting point. The road south from the bridge leads to St. Joe City (population 50), originally a railroad camp formed during construction of the track and tunnel up the valley and across Montana in 1907. This is the main line of the Chicago, Milwaukee, St. Paul and Pacific whose tracks run along the river. It became a hub of activity during the logging boom of the early 1900's which was ended by the 1910 fire, but now is a small settlement of just a few families. Remnants of the docks at which regularly scheduled steamboats from Coeur d'Alene stopped can be seen along the river. The road north joins the road which goes through Avery (population 450), a railroad and logging town situated where the North Fork of the St. Joe River joins the main branch. The road then continues on to the Ranger Station at Red Ives, where it ends.

Although boats may be able to go a little further, from here on the flood plain narrows, the river becomes more swift, with numerous rapids and it is not advisable to continue upstream. So turn around and return to St. Maries looking for things that might have been missed on the trip up.

DOWNSTREAM

From St. Maries continue downstream into Lake Coeur d'Alene. For the first 4 miles, the path is still between manmade levees. The land on either side has been reclaimed and is now productive farmland due to flood control. Six miles downstream on the north is Mission Point where Catholic priests built the first Jesuit mission in Idaho in 1842. This was a beautiful site in the summer and fall, but was covered by flood waters in the spring, so in 1846 the mission was moved to Cataldo, where the original church still stands.

HEYBURN STATE PARK

About a mile further on, though there is no marker, the river enters the Heyburn State Park, 8,000 acres of lakes and forests, including Benewah Lake, Chatcolet Lake and Hidden Lake – all of which are actually part of Lake Coeur d'Alene. Idaho's first state park, the land was purchased from the Coeur d'Alene Indians in 1908 for $1.25 an acre.

Soon after passing this boundary begins the unique experience of traveling on a river bounded by natural levees that have been built up through the years by deposition of sediments. Tall trees, bushes, and grass grow on the banks and between them the river current flows entirely independently of the lake waters on either side. Round Lake can be glimpsed to the north, with Chatcolet Lake on the south. Passageways have been cut through the levees so the lakes can be entered at various points but the river keeps its identity as the Shadowy St. Joe for another 4 or 5 miles (see figure 7).

OSPREYS

This is an especially interesting stretch because of the many osprey nests. The osprey, or fish hawk resembles the eagle but is smaller and slimmer with a white head and breast – no other large hawk has so much white on the breast. The huge nests are platforms of sticks built on the broken off part of tall tree snags (cottonwoods) and are used year after year. Young birds are in the nests in June and July. They live almost entirely on fish and dive in the most dramatic fashion. Great blue herons may also be seen flying over the area.

CHATCOLET LAKE

The river continues to flow between two lakes but the banks gradually become very narrow with consequent disappearance of much of the vegetation until finally they are completely submerged. From here one can travel on to any point in Lake Coeur d'Alene, but by swinging left into Chatcolet Lake boats may dock at Rocky Point, where there is a fine sandy beach for swimming, a picnic area and a lodge where meals and snacks are served. This is in Heyburn State Park. The forest cover of the park is made up mainly of yellow pine on the higher slopes and fir and larch on the lower areas. The yellow pine slopes are more or less open with patches of heavy buck brush in the ravines and on the lower portions of the slopes. The fir and larch areas cover by far the main portion of the park. White fir and Douglas fir predominate with lodgepole pine and cedar found in their natural habitat. There are no year-around streams flowing through the park, but there are two intermittent streams and numerous springs.

From here one can go east around Rocky Point, under the railroad bridge (where there is excellent bass fishing) and cross into Benewah Lake. Before this area was flooded by construction of the Post Falls Dam, which raised the water level about 8 feet, it was an Indian meeting ground. Indians gathered from all parts of the northwest every year for games. Arrowheads and artifacts can occasionally be found during low water. Boats can also dock here at Silver Tip; picnic grounds, campgrounds and lodge facilities are available. From here, return to the river and go upstream to St. Maries.

This entire trip as described can easily be made in one day with a motor boat, although all day could be spent on either the upstream or downstream portion if more time was spent on shore, or stops were made along the way. Short portions could be covered by rowboat or canoe. Although this tour was written specifically for the St. Joe, similar trips could be taken on many of Idaho's lakes and rivers not only for fun and relaxation but to learn about the environment.

Transportation and historical information for this tour was provided by Emery Hedlund, St. Maries, former vice-chairman of the State Parks Board.

MAPS:

Having the proper maps will make the trip much more interesting. The following maps include the portion of the St. Joe covered in this tour:

St. Joe National Forest (free from Forest Supervisor, St. Maries)

TOPOGRAPHIC MAPS:

St. Maries Quadrangle: covers area described
St. Joe Quadrangle: covers area described
Plummer Quadrangle: includes Lake Coeur d'Alene and area west
Calder Quadrangle: covers upper St. Joe River to the east.
Wallace Quadrangle: covers upper St. Joe River to the east

MAP EXERCISE:

Even if this area can't be visited personally, a great deal can be learned about the area by studying the above maps. Following are some suggestions for problems to explore.

1. Notice the drainage pattern of the St. Joe River. Determine how wide the St. Joe River Basin or Watershed is. How many tributaries does the river have?
2. From the map of the St. Joe Forest, try to find where the main branch of the St. Joe River begins; where the North Fork arises.
3. Notice how the flood plain varies in width. Where is it the widest? Why?
4. Determine the gradient (the drop in elevation in feet per mile) at several different points.
5. From examination of the path of the St. Joe River, what stage of development is it in (youthful, mature, old) near its source? near Avery? near St. Maries?

NEZ PERCE AND LEWIS COUNTIES

LEWISTON

Entering Nez Perce County on U.S. 95 from the north, the route is at first over a plateau covered with loess underlain by beds of basalt which are deeply disected by streams to the east. The plateau is folded sharply down into the Lewiston Basin to the south. From the edge of the plateau at the top of Lewiston Hill, there is a spectacular view of the outstanding features of the county. The highway itself winds down the Clearwater escarpment, a cliff carved by erosion from the folds in the basalt. This escarpment is approximately 2,000 feet high. The Lewiston Basin, which includes the benchland south of Lewiston is important economically for here is located the city of Lewiston, Idaho's only seaport, at the confluence of the Clearwater and Snake Rivers. Its sheltered position provides a mild climate for growing fruits and vegetables.

Also visible from the hill is Potlatch Forest's multi-million dollar plant along the Clearwater where lumber, plywood, paper and other wood products, valued at 12 million dollars or more annually, are produced. (See study trip guide for tour information.)

The Clearwater River coming in from the east travels along the base of the escarpment previously mentioned. Beyond the basin is the Lewiston Plateau which merges into the Camas Prairie to the south. Hay, peas, wheat and other grain crops are raised here.

NEZ PERCE PARK

Traveling on down the highway to Lewiston, the lowest spot in Idaho (747 feet), U.S. 95 turns east and follows the Clearwater River for several miles. Located 6.3 miles east of Lewiston is a State Historical Sign marking "Coyote's Fishnet", a formation on the face of the bluff of the south shore of the river, and the "Bear", high up on the hills on the north side of the river. This is part of the Nez Perce National Historical Park which consists of 22 parcels of land in Idaho (see map, figure 9). Spreading from this point on the west to Lolo Pass on the east and south to the Whitebird Battlefield, the Park brings together separate sites of historical significance under Park administration and care.*

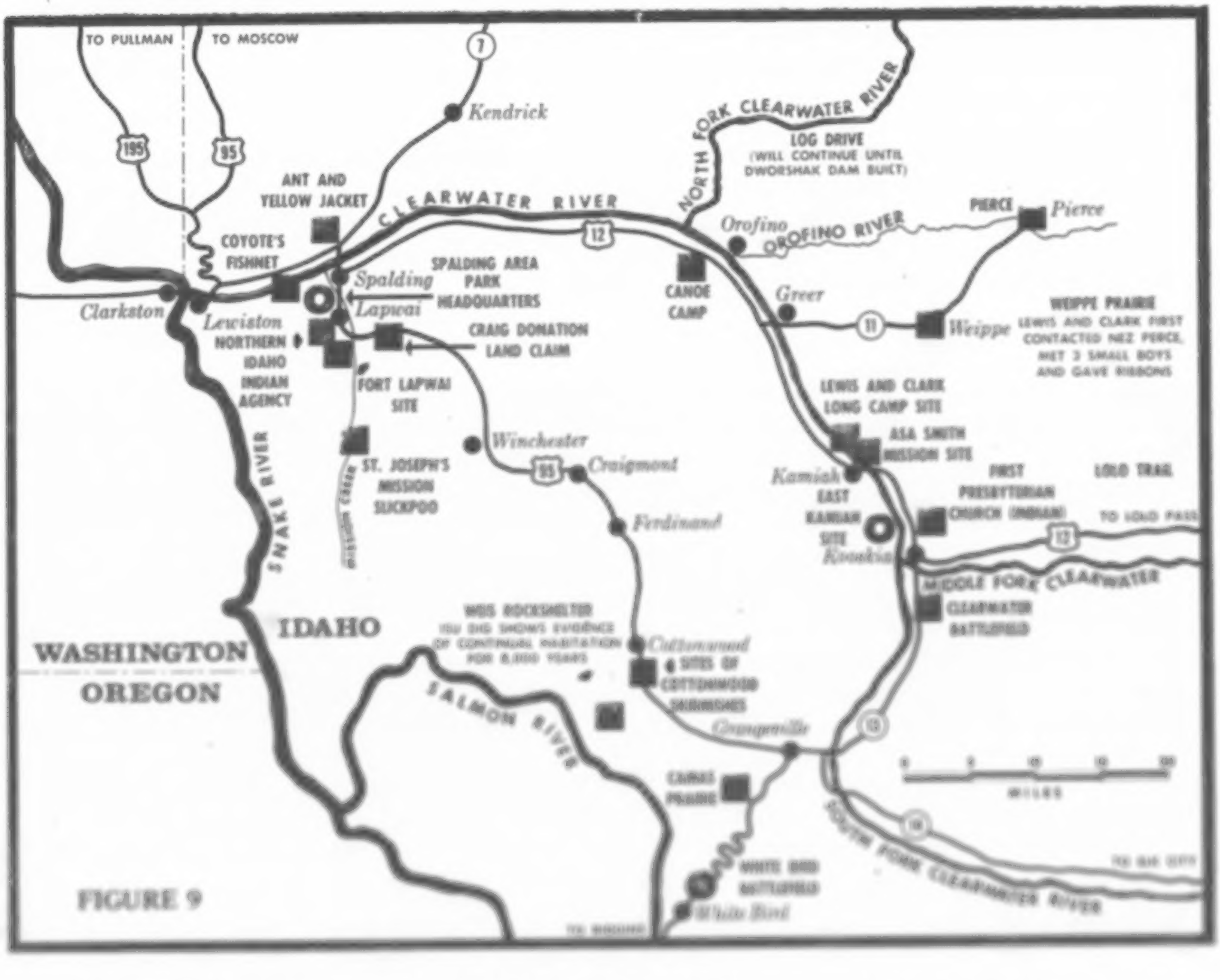

TO PULLMAN
TO MOSCOW
7
Kendrick
195
95
ANT AND YELLOW JACKET
CLEARWATER RIVER
NORTH FORK CLEARWATER RIVER
LOG DRIVE (WILL CONTINUE UNTIL DWORSHAK DAM BUILT)
12
Orofino
OROFINO RIVER
PIERCE
Pierce
COYOTE'S FISHNET
SPALDING AREA PARK HEADQUARTERS
Spalding
Lapwai
CANOE CAMP
Greer
Clarkston
Lewiston
NORTHERN IDAHO INDIAN AGENCY
CRAIG DONATION LAND CLAIM
11
Weippe
WEIPPE PRAIRIE LEWIS AND CLARK FIRST CONTACTED NEZ PERCE, MET 3 SMALL BOYS AND GAVE RIBBONS
FORT LAPWAI SITE
LEWIS AND CLARK LONG CAMP SITE
ASA SMITH MISSION SITE
Winchester
95
Craigmont
Kamiah
EAST KAMIAH SITE
FIRST PRESBYTERIAN CHURCH (INDIAN)
LOLO TRAIL
TO LOLO PASS
ST. JOSEPH'S MISSION SLICKPOO
SNAKE RIVER
Ferdinand
Kooskia
MIDDLE FORK CLEARWATER
CLEARWATER BATTLEFIELD
WEIS ROCKSHELTER
IDAHO
Cottonwood
SITES OF COTTONWOOD SKIRMISHES
WASHINGTON
OREGON
SALMON RIVER
Grangeville
13
CAMAS PRAIRIE
MILES
14
SOUTH FORK CLEARWATER RIVER
WHITE BIRD BATTLEFIELD
White Bird

FIGURE 9

---

*For more information, write to the Idaho Department of Commerce & Development, Boise, for a descriptive brochure, "History in a Modern Showcase", Nez Perce National Historical Park.

Three miles further east a sign marks another site, the "Ant and Yellow Jacket", also a rock formation, which figured prominently in Nez Perce Indian legends as did "Coyote's Fishnet". The formation is a rock arch on a steep hillside immediately north of the highway at the new interchange of U.S. 95 and 12. U.S. 95 crosses the river to the south while U.S. 12 continues on a couple of miles before crossing at the junction of the Lapwai Creek and Clearwater River 10 miles east of Lewiston. This is the "Spalding Site" with remains of the Spalding Mission and the graves of Henry and Eliza Spalding. Headquarters of the Nez Perce National Historical Park are located here.

INDIAN AGENCY

Continuing south four miles from Spalding, U.S. 95 passes through Lapwai, headquarters for the Northern Idaho Indian Agency which administers Indian affairs, both for the Nez Perce and for other tribes of northern Idaho including the Kalispells, Kootenais, and Coeur d'Alenes. Nearby is the site of Old Fort Lapwai. Up Mission Creek is St. Joseph's Mission at Slickpoo, also part of the Nez Perce National Historical Park. Founded as a mission school by Father Cataldo of the Society of Jesus in 1904, St. Joseph's School is still active. Also of interest in the Mission Creek area are deposits of limestone, some of which contain coral-like fossils. There are also outcrops of limestone along both sides of Mill Creek about 2.5 miles south where it joins Mission Creek at Slickpoo. (Slickpoo is derived from the name of Zimchiligpusse, the first Indian Chief to be baptized)

From the Clearwater River, U.S. 95 ascends the canyon southward on to the plateau. The canyon slopes are covered with sediment which display evidence of creeping, and patterned ground. Up canyon remnants of alluvial gravel narrow, terraces are lacking and talus slopes replace the sediment. The forest is mainly of Douglas fir. The plateau summit is mostly bare basalt covered by loess. In places granite hills project through the basalt.

CRAIG MOUNTAIN

One portion of the county not seen from any of the highways is the Craig Mountain uplift in the southwest portion which rises 5,000 feet above sea level. The slopes are steep, often inaccessible, and are used mostly for cattle range and logging operations. To the west the Snake River has formed a magnificent canyon 4,000 feet deep and 15 miles wide at the top, with canyon walls composed almost entirely of basalt. These become progressively lower until at Lewiston the walls rise only 50 feet above the river.

RIVERS

The Salmon River forms the southern boundary of the county for about 10 miles before it joins the Snake at the deepest part of the canyon. In this region, volcanic and sedimentary beds have been exposed and contain most of the metallic mineral resources of the county.

U.S. 12 follows the Clearwater River which flows east and west across the county in a picturesque canyon, unique because the north wall is many times higher than the south wall. Joining the Clearwater from the north at about the mid-point east-west of the county is the Potlatch River which has cut a deep canyon in the high plateau north of the escarpment.

MINERALS

Some placer gold was probably mined from the Clearwater by prospectors on their way upstream to richer areas; on the eastern edge of the county, copper and gold lodes were mined in the Peck, Clearwater and Cave Gulch mining districts, however, these were never good producers. The richest minerals in Nez Perce County are limestone, gravel, sand and clay.

LEWIS COUNTY

WINCHESTER STATE PARK

U.S. 95 runs through Lewis County for just a short distance across the loess covered prairie before entering Idaho County. About 30 miles south of Lewiston, a road turns off to Winchester State Park, which consists of 320 acres including a 90-acre lake, formed originally when Lapwai Creek was dammed for a mill pond by the Boise Cascade Corporation. The west, north and a portion of the south shores of the lake are heavily wooded with ponderosa pine; the east side was the site of the old mill which has been removed. Opened to the public in 1968, it is popular with fishermen as the lake is stocked with rainbow trout. By the summer of 1969, facilities should include a picnic area, a 60-unit campground, boat ramps and a swimming beach. This is a unique area which provides many educational as well as recreational opportunities to students of the area, or to others who might be passing through.

U.S. 12 skirts the Clearwater River, which forms the eastern boundary of the county. It passes through picturesque Kamiah Valley where several Nez Perce Historical Park sites are located – the Asa Smith Mission site (1840), Lewis & Clark Long Camp site (1806), the First Presbyterian Church (Indian) constructed in 1874 and still in use, and an old cemetery.

CANYONS

The rest of the county, which is primarily used for agriculture, is crisscrossed by roads around almost every square mile except in the regions of several deep rugged canyons – Lawyers Canyon, which separates Lewis County and Idaho County to the south, Big Canyon, between Nez Perce and Lewis Counties on the north, Little Canyon (running parallel to Big Canyon), and Five Mile and Six Mile Canyons running into the Clearwater River on the eastern edge of the county northwest of Kamiah.

SUMMARY

Many of these features and sites can be observed easily from the highways or county roads without leaving the car. Even more can be learned by closer examination during selected stops. There are many places along the Clearwater River where ecology and geology can be studied; many creeks also provide opportunity for study, not only along the roads but also in the deep canyons which border the counties; while most of the canyons are not easily accessible, the variety of features they offer make them worth the effort involved in reaching them.

IDAHO COUNTY

INTRODUCTION

The largest county in the state, Idaho County is a rough, mountainous region cut by the deep canyons of the Snake, Clearwater, Salmon, Locksaw and Selway Rivers, with extremes of elevation, climate, and vegetation. Like Boundary and Bonner Counties, it extends clear across the state from Oregon to Montana, however, its width is almost three times that of the northernmost counties, for it is 125 miles across.

ROADS

U.S. 95 goes north and south through the western part of the county and U.S. 12 cuts across to Montana along the Clearwater and Locksaw Rivers, following the Lolo Indian Trail used by Lewis

NEZ PERCE NATIONAL FOREST

AREA NO. 1 Idaho Fish and Game Department Hatching Channels

Located near Fenn Ranger Station (Red River Ranger Station and Orogrande). Anadromous fish eggs are planted in the channels. After hatching, the fish are counted and then released into the river. The life cycle is completed when the fish return to the general holding area to spawn.

AREA NO. 2 Central Christie Range Demonstration Allotment

This is a self-explanatory tour of a cattle grazing area with signs pointing out range management items of interest. Access is by pickup or similar type vehicle.

AREA NO. 3 Graves Point Lookout

Lookouts are one method used to detect forest and range fires. This tower is usually manned from the middle of June until the middle of September and has an excellent view of the Snake River Canyon. Different geologic stratifications are visible along the canyon walls. Access is possible by automobile.

AREA NO. 4 Florence Townsite and Cemetery

Florence is an old mining town which originated in the 1860's. A few log cabins remain. An additional attraction is the Florence Cemetery. This area is accessible during the summer and early fall with a pickup or similar vehicle.

AREA NO. 5 Gospel Peak Area

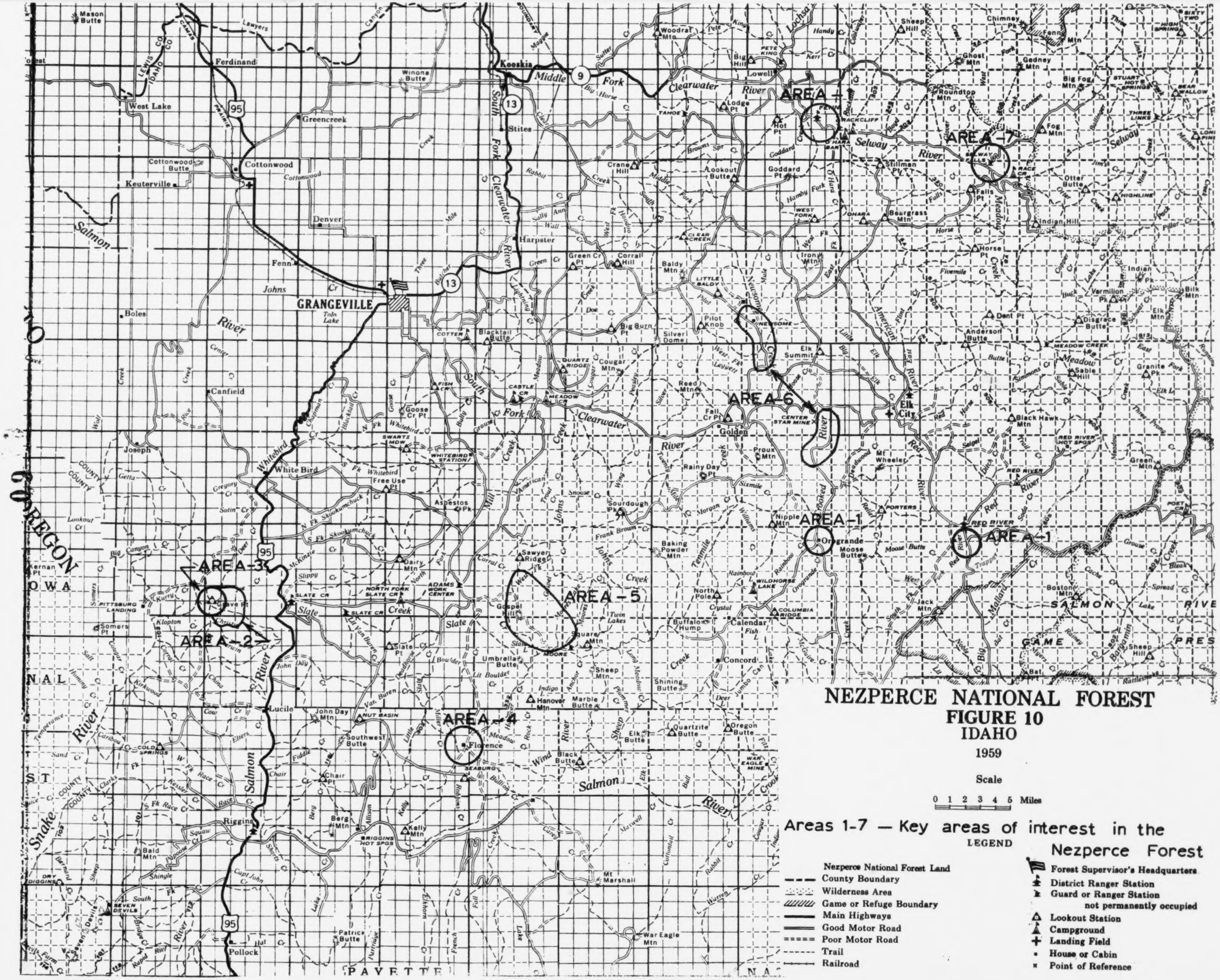
High mountain peaks and outstanding examples of glacial geology are the main features of this area. It is accessible by pickup from July through September.

AREA NO. 6 Newsome Creek and Crooked River Dredge Mining Areas

Long expanses of stream bottoms have been dredged for gold during the past 50 years. Mining was conducted in Crooked River as recently as 1960. There are also good examples of hydraulic mining areas called "Glory Holes", accessible by automobile or bus from June through the middle of October.

AREA NO. 7 Selway Falls and Fishway

Rock slides created Selway Falls and caused partial blockage for steelhead migrating to the upper Selway River spawning areas. The Idaho Fish and Game Department recently completed a fishway which permits fish to bypass the falls.



NEZPERCE NATIONAL FOREST
FIGURE 10
IDAHO
1959

Areas 1-7 — Key areas of interest in the Nezperce Forest

Scale
0 1 2 3 4 5 Miles
LEGEND
Nezperce National Forest Land
County Boundary
Wilderness Area
Game or Refuge Boundary
Main Highways
Good Motor Road
Poor Motor Road
Trail
Railroad
Forest Supervisor's Headquarters
District Ranger Station
Guard or Ranger Station not permanently occupied
Lookout Station
Campground
Landing Field
House or Cabin
Point of Reference
AREA-1
AREA-2
AREA-3
AREA-4
AREA-5
AREA-6
AREA-7
GRANGEVILLE
Cottonwood
Ferdinand
Greencreek
Keuterville
West Lake
Kooskia
Stites
Harpster
Fenn
Denver
Boles
Canfield
Joseph
White Bird
Lucile
Riggins
Pollock
Florence
Elk City
Orogrande
Golden
Lowell
Concord
Pittsburg Landing
Mason Butte
Cottonwood Butte
Winona Butte
Tolo Lake
Middle Fork Clearwater River
South Fork Clearwater River
Clearwater River
Selway River
Lochsa
Salmon River
Snake River
Red River
American River
Crooked River
Newsome Creek
Slate Creek
Whitebird Creek
Johns Creek
Meadow Creek
Wind River
Big Mallard
OREGON
PAYETTE
LEWIS CO
IDAHO CO
SALMON
GAME
PRES
9
13
95

and Clark in 1805. There are a few short sections of state highways but most of the county is served by National Forest Service Roads.

NATIONAL FOREST

All but a small section of the northwest corner (the Camas Prairie) and the Salmon River Valley from Riggins north is national forest land – Clearwater, Nez Perce, Bitterroot and Payette Forests; one and a quarter million acres in the eastern portion belongs to the Selway-Bitterroot wilderness area. Although much of this area is not accessible except in the summer, it is nationally known by fishermen and hunters for its fine salmon and trout fishing and big game. It is also of interest because of its historical significance. The fascinating geology and variety of ecological habitats have produced many features of educational value.

A map of the Nez Perce Forest, marked with areas of special interest is included here as an example of the kinds of resources which exist in the county. (see figure 10). These are also typical of features found in national forests throughout the state.

Because of its size, variety of natural resources and historical importance, it would be impossible to adequately cover Idaho County here; however, a large two-volume work Pioneer Days in Idaho County by Sister Alfreda M. Elsensohn of Cottonwood describes the history of the early settlers and Indians in detail (in Volume 1) and discusses the rivers, mountains, mines, forests, and other features (Volume 2). The book is well documented and includes a complete bibliography of books, pamphlets, periodicals, and newspapers.* St. Gertrude's Academy of Cottonwood also maintains a museum from which a great deal of history can be learned.

RIGGINS

HISTORY AND GEOLOGY

The Riggins area is of both historic and geologic interest. Historically, conflict between Chief Whitebird's Nez Perce Indians and the white settlers along the Salmon River and in the mountains ranged from raids and harrassment to all-out battles, one of the main ones being at Whitebird Creek on June 17, 1877.

The primary cause of this conflict was the geology of the area which drew thousands of miners to the gold deposits near Pierce, and later to Florence in the mountains east of the river. These were followed by settlers and stockraisers, and thus the friction grew as the whites encroached on Indian territory.

Although gold-mining lasted only a few years, the interesting geology remains, for at Riggins is not only the confluence of the Salmon and Little Salmon Rivers, but also the junction of several different rock formations – Columbia River basalt directly west of town; Seven Devils volcanics just north of Riggins and north of the Salmon River before it joins the Little Salmon; and south of the Salmon and surrounding the basalt and volcanics are Triassic sedimentary rocks that have been twisted and contorted into schists.

*Originally published in 1947, it was recently reissued by Caxton Printers, Caldwell, Idaho.

Below are listed some features which can be easily seen in the vicinity of Riggins with suggested questions for possible study and investigation.

EAST:

Salmon River

There are several interesting features along the road up the Salmon River east of Riggins. The Salmon River Lumber Company's mill is on the left. To the right, just past the rodeo grounds, well-sorted layers of sediment are visible. Cobblestones, silt, sand and sharp rocks are visible in the 20 to 40-foot high cuts. Under what conditions are rocks and sediments separated so distinctly?

To the left is the first of many sand bars seen along the Salmon River. What is the source of the sand, and what causes the bars to form? Do they form in any particular location in the river or do they form at random?

Across the river is a small anticline and tilted layers of rocks. These are probably schists of the Seven Devils volcanics.

Erosion and Fire

Further along, note the eroded hills to the right. Is this due to natural causes, or has this area been excavated for some reason? Is there any evidence of fire anywhere through the canyon? Look especially along the top of the hill to the right above Cat Creek.

At the bridge (7 miles east of Riggins) white rock has intruded through the darker rock. Layers of clam shells and also large sheets of biotite mica have been found in this vicinity. What are possible sources of the intrusions, clam shells and mica? Are they related? Note growth of mosses and lichens on the rocks. Under what conditions do these seem to thrive?

Garnets

One mile east of the bridge are the Ruby Rapids, a favorite garnet-collecting spot. Small garnet crystals and mica schists peppered with garnets are found in the side of the hill above Ruby Rapids and along the river on sandbars and in pockets. Remember that this is part of the Nez Perce National Forest and topsoil and overburden should not be removed by digging – especially along the road where sloughing and erosion might be a problem.

Note rock formation on the hill south of the river directly across from Ruby Rapids. How does it differ from the surrounding rocks? Even without knowing the names of rocks or rock formations, speculations as to their origin and relationships can be made.

Riggins Hot Springs

On further east Riggins Hot Springs, a resort with cabins and an outdoor pool, lies across a narrow bridge. Indians were frequent visitors to the springs, soaking in the mud baths and drinking the mineral water which contains large amounts of magnesium and calcium carbonate.

Half a mile beyond the Hot Springs is the Allison Creek Road which leads to the site of the old mining town of Florence (about 25 miles). Accessible only during the summer and early fall with a pickup or jeep, scarcely a trace of the town remains among scars of the old diggings, but inscriptions in the cemetery provide an insight into the history of the area.

The Allison Creek campground on the river has water, tables, and restrooms.

To McCall

The road continues along the Salmon River for about 20 miles before it turns south at French Creek and climbs up a series of switchbacks to Burgdorf. The view from the top looking down into the canyon is spectacular. From here, a road leads east to the Warren mining area and into the Primitive Area, or south to upper Payette Lake and then to McCall through the Payette National Forest.

Caves

Also near Riggins are limestone caves. One of these, the Papoose, is west of Riggins in the Seven Devils (rather difficult to reach), and another is one mile south of Lucille on a hill above U.S. 95. Contact the Gem State Grotto of the National Speleological Society, Box 695, Mountain Home, Idaho 83647, c/o Jerry Thronton, for more information on these and other caves of Idaho. The Gem State Grotto members are attempting to map all the caves of Idaho – a monumental task due to the numerous lava tubes and tunnels under the Snake River Plain – and welcome anyone who is interested in spelunking.

NORTH:

Gospel Peak

About 18 miles north of Riggins, a road to the east up Slate Creek leads to the Gospel Peak area. Outstanding examples of glacial geology are the main features of this area, which is accessible by pickup during the summer months.

There are many interesting features in the Nez Perce National Forest to the north and west of Riggins. Contact the Forest Supervisor at Grangeville for more information (see map, Figure 10).

SOUTH:

Fish Hatchery

Six miles south of Riggins the Circle C chinook and steelhead hatchery is located on the Rapid River. This hatchery is open year around and spawning salmon can be seen from mid-August to mid-September. It is 2 miles off the main road and there are picnic facilities available. Constructed by the Idaho Power Company in 1964, the facility is operated by the Idaho Fish and Game Department. For more information concerning visits to this hatchery, call Riggins 628-3277.

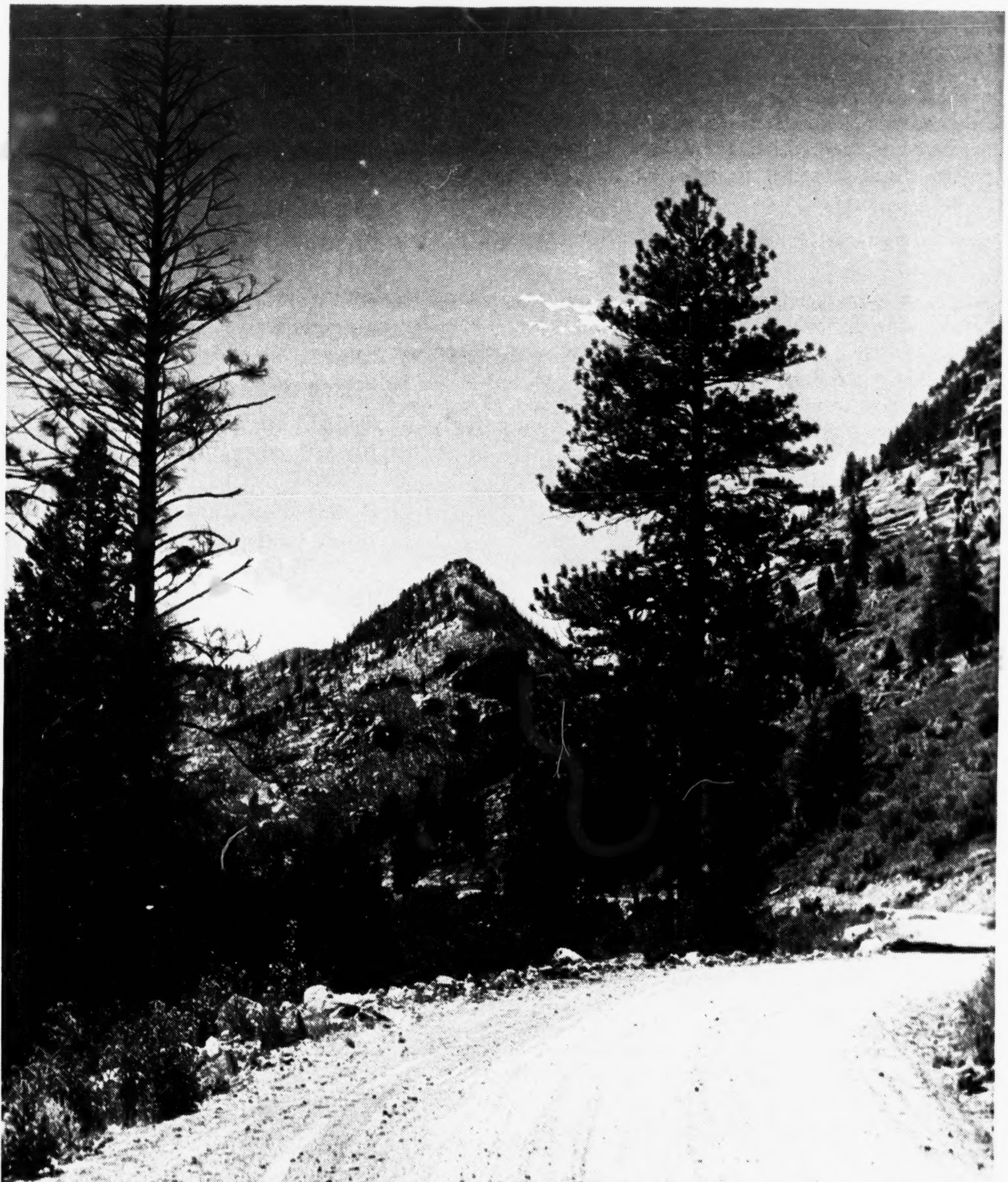
Little Salmon River

Creeks cascade into the Little Salmon River from both sides, east and west almost every mile. One of the most scenic is Fall Creek about halfway between Riggins and New Meadows. A small falls is visible just a few feet west of the highway, but the main falls, tumbling over basalt rock, is best seen by climging a 3-foot hill (on top of which is a sign advertising the Fall Creek Store).

The Little Salmon River actually arises in the mountains south of New Meadows, though it receives most of its water as it flows through Meadows Valley. It meanders sluggishly for a few miles with a wide streambed until the valley narrows, and suddenly, about 11 miles north of New Meadows, all of the water is funneled into a narrow canyon which drops from elevation 3,800 to 1,800 feet at Riggins in less than 30 miles, a gradient of about 70 feet to the mile.

WEST:

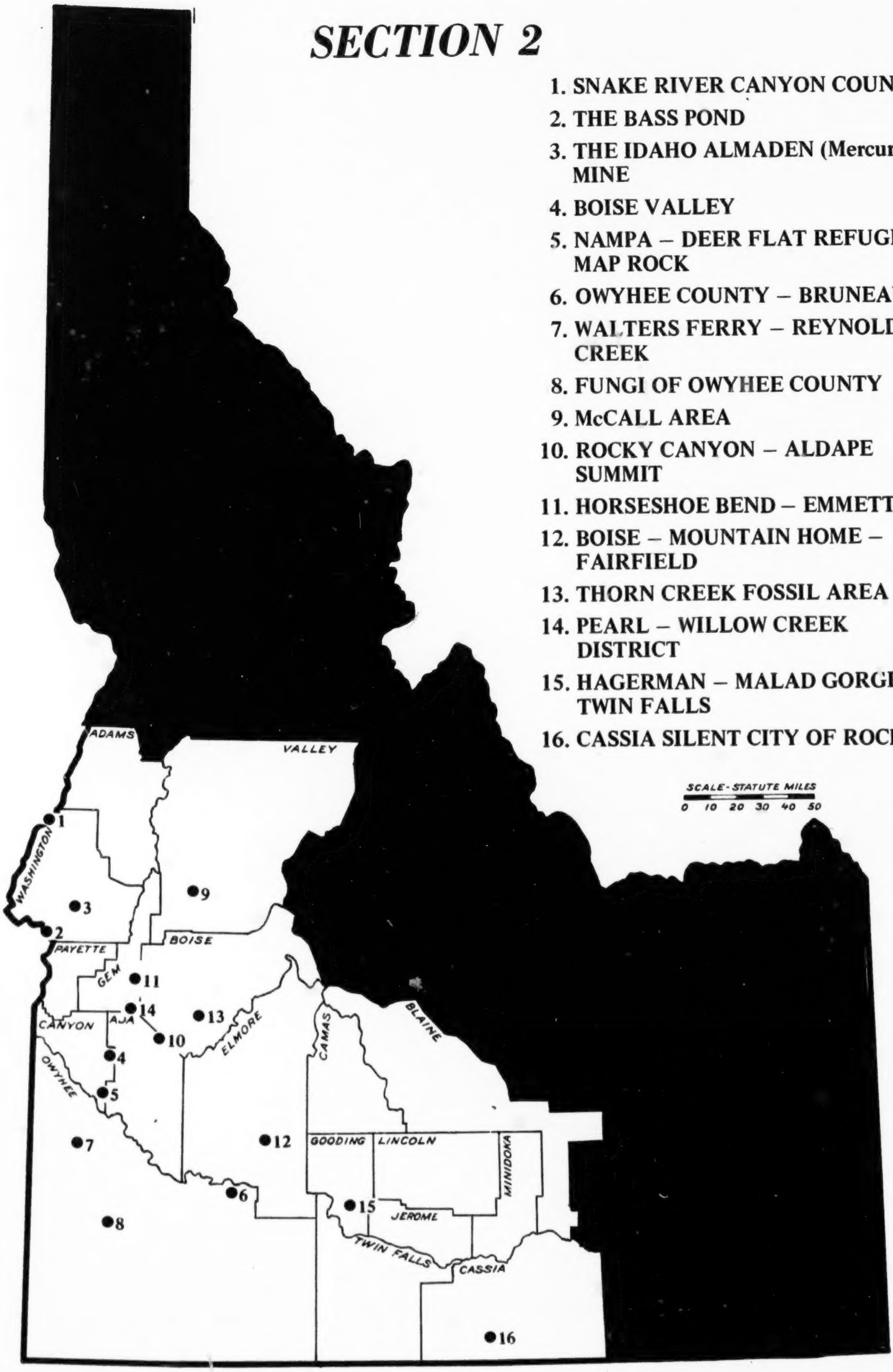
For information about the Seven Devils and Hells Canyon to the west and southwest, see Tour 1, Section 2.

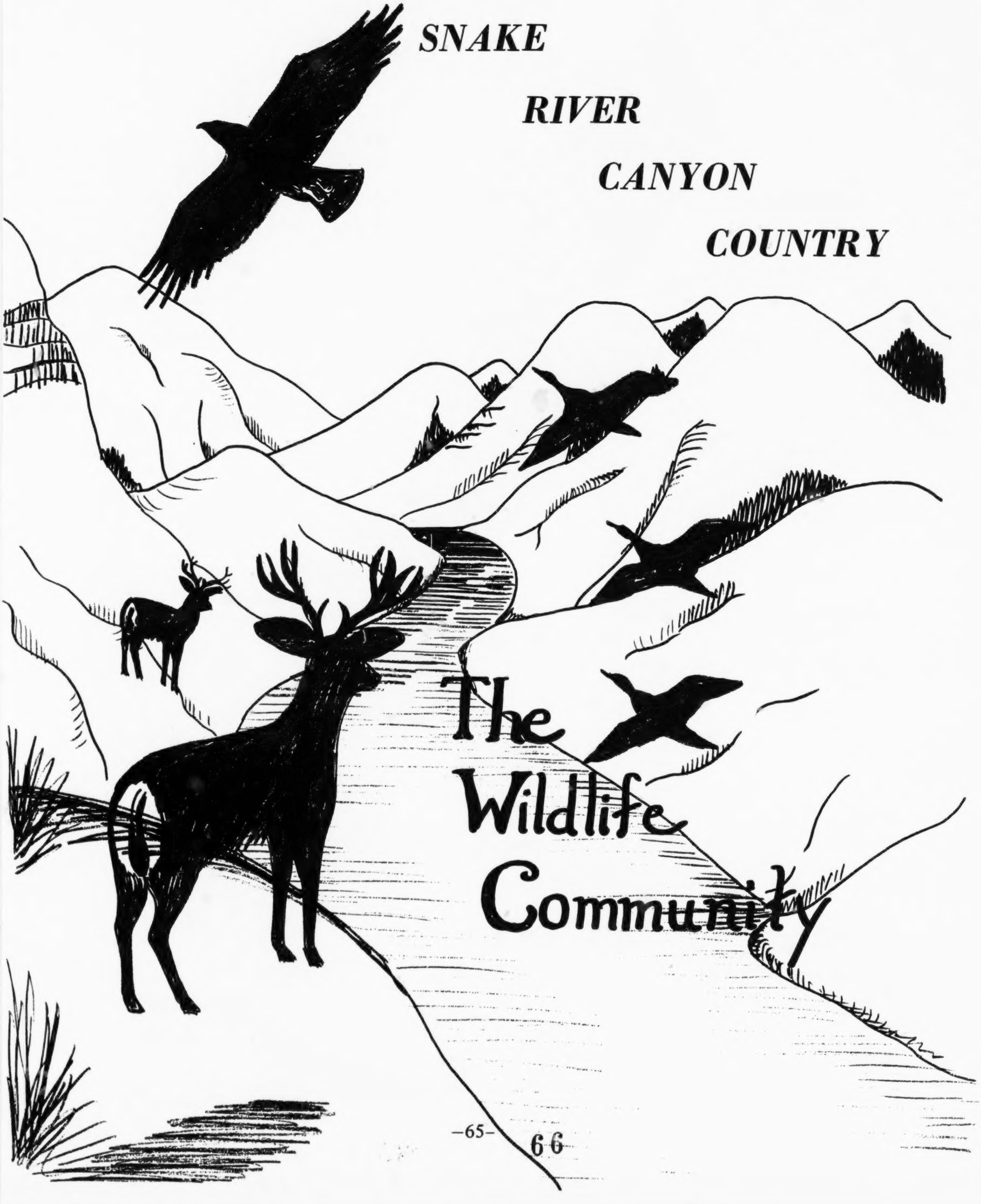


Lick Creek Summit, east of McCall (Photo courtesy Bob Lorimer)

SECTION 2

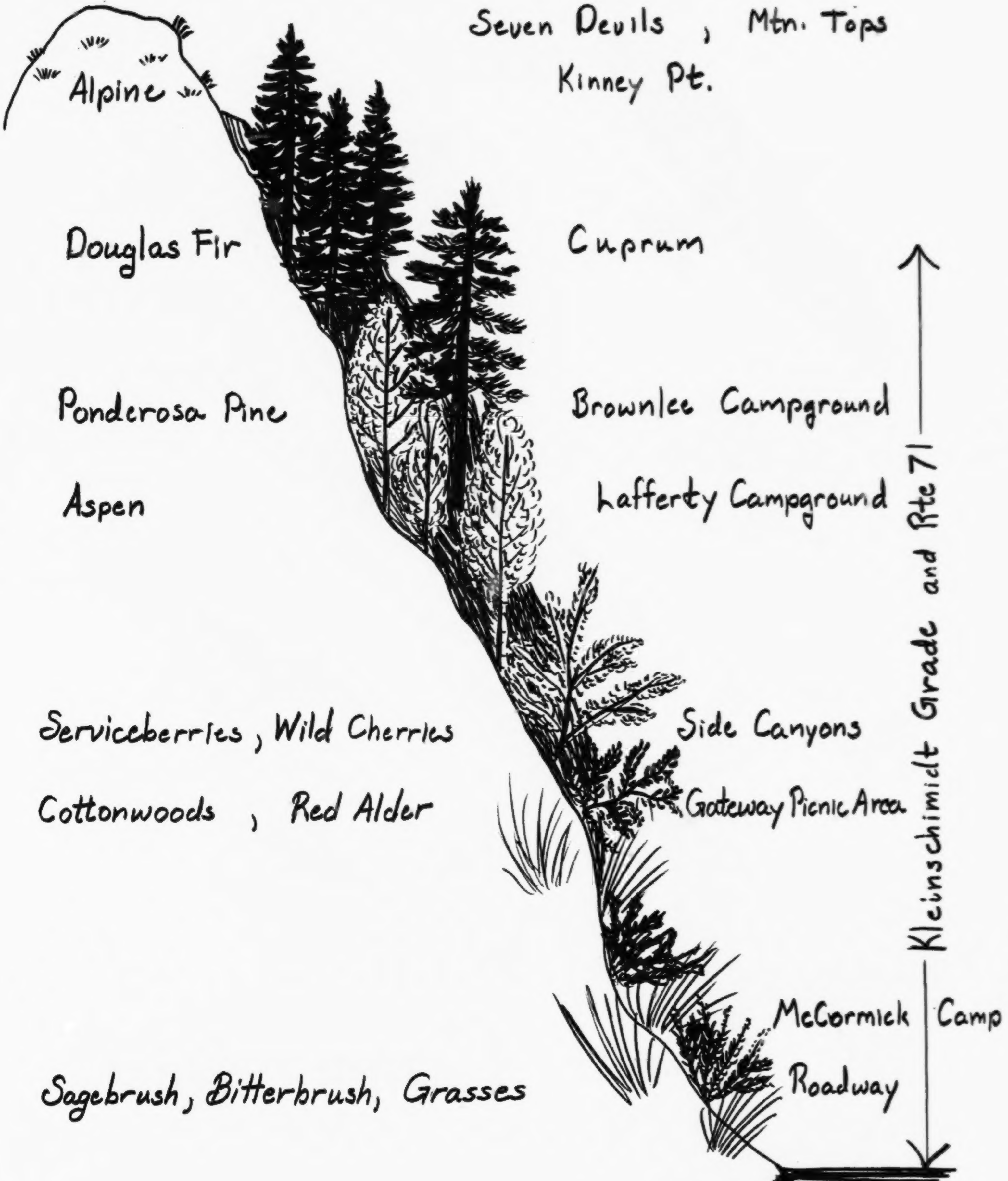
1. SNAKE RIVER CANYON COUNTRY
2. THE BASS POND
3. THE IDAHO ALMADEN (Mercury) MINE
4. BOISE VALLEY
5. NAMPA – DEER FLAT REFUGE – MAP ROCK
6. OWYHEE COUNTY – BRUNEAU
7. WALTERS FERRY – REYNOLDS CREEK
8. FUNGI OF OWYHEE COUNTY
9. McCALL AREA
10. ROCKY CANYON – ALDAPE SUMMIT
11. HORSESHOE BEND – EMMETT
12. BOISE – MOUNTAIN HOME – FAIRFIELD
13. THORN CREEK FOSSIL AREA
14. PEARL – WILLOW CREEK DISTRICT
15. HAGERMAN – MALAD GORGE – TWIN FALLS
16. CASSIA SILENT CITY OF ROCKS


SCALE - STATUTE MILES
0 10 20 30 40 50
ADAMS
VALLEY
WASHINGTON
PAYETTE
BOISE
GEM
CANYON
ADA
OWYHEE
ELMORE
CAMAS
BLAINE
GOODING
LINCOLN
MINIDOKA
JEROME
TWIN FALLS
CASSIA
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16



SNAKE RIVER CANYON COUNTRY

The Wildlife Community


Seven Devils , Mtn. Tops
Kinney Pt.
Alpine
Douglas Fir
Cuprum
Ponderosa Pine
Brownlee Campground
Aspen
Lafferty Campground
Kleinschmidt Grade and Rte 71
Serviceberries , Wild Cherries
Side Canyons
Cottonwoods , Red Alder
Gateway Picnic Area
McCormick Camp
Roadway
Sagebrush, Bitterbrush, Grasses
Snake River

SNAKE RIVER CANYON

BY: Nancy Norseen – Barbara Littlejohn

The portion of the Snake River Canyon described here is the area viewed after leaving Cambridge and traveling northwest on Highway 71. The highway reaches the Snake River at Brownlee Dam and crosses the river to continue skirting the river on the Oregon side, until the Oxbow Dam.

The highway then crosses the river again at the Oxbow and continues along the Idaho bank of the river until it reaches Hells Canyon Dam, the third of the three-dam complex comprising Idaho Power Company's T. E. Roach Hells Canyon Development. The road ends here and only authorized travel is allowed beyond this point.

The Kleinschmidt Grade leaves the highway about 7 miles from the Oxbow Dam and climbs to an elevation of over 4,000 feet. From the Grade, one gets an excellent impression of the height of the Canyon.

Near Cuprum, above the Canyon, are many rivers and streams that eventually flow to the lower Snake River. From Cuprum to Lafferty Campground the terrain is strikingly different from that of the Canyon, and for that reason is particularly interesting in a comparative study.

NOTE: The Kleinschmidt Grade is a tortuous, narrow dirt road. The traveler should be aware that skilled driving is necessary. There is no gas available between Oxbow and Council.

River
Otter

KEY TO LOCATIONS

The following is a key to locations for the plant and animal descriptions:

B	- Brownlee Campground – Located in a large ponderosa (yellow) pine stand.
BG	- Beggs Picnic Area (BLM) – The canyon of the creek is bordered by serviceberry, cottonwood and red alder. Note north and south canyon walls.
O	- Oxbow Dam area – This area is the heart of the Snake River Canyon. Note vegetation on both west and east slopes.
R	- Recreation area opposite Kleinschmidt Grade. This area is on the Snake River opposite the beginning of the Grade. The winding road can be observed before ascent. Note vegetation from the river to the top of the mountains.
KG	- Kleinschmidt Grade – The grade ascends from 1,680 feet at the river to a summit of 4,000 feet. Note vegetative changes during ascent, i.e. grasses, shrubs, conifers, snow fields.
C	- Cuprum – A coniferous forest (ponderosa pine and Douglas fir). Note high rocky meadows with sagebrush.
L	- Lafferty Campground – Ponderosa pine stand. Note willows along the creek.

Following are descriptions of representative plants and animals of the Snake River Canyon. These are based on observations made during the spring of 1968. Many of these may also be found in other parts of the state.

Trees of the Snake River Canyon and Mountains

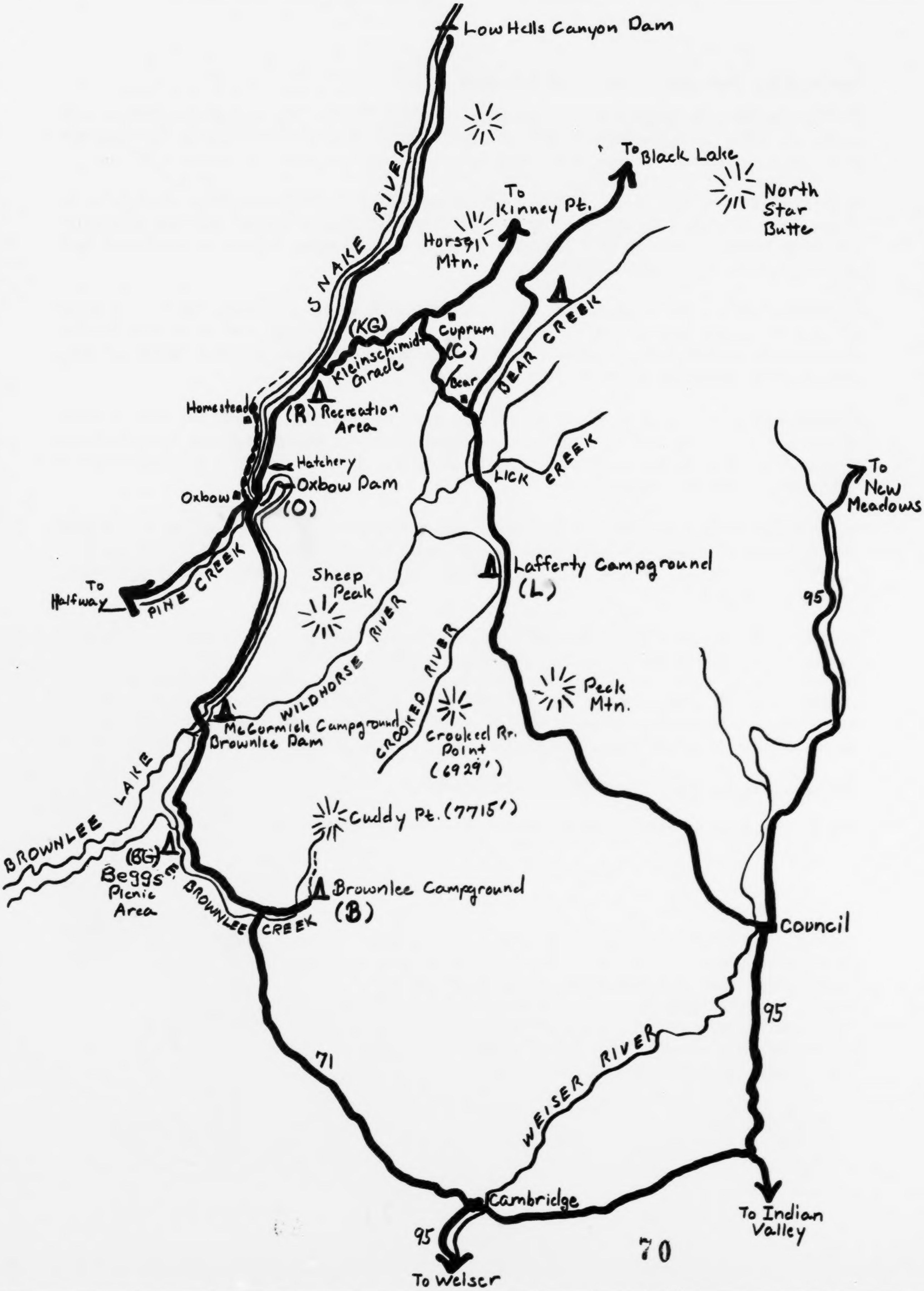
PONDEROSA OR YELLOW PINE - Needles: In bundles of three, 3"-10" long, dark green. Cones: 2"-4" long; scales thickened at tip and bearing a sharp spine. Bark: On old trees, broad, thick, with large yellowish to orange-colored plates. On young trees, dark colored with narrow furrows and ridges.

DOUGLAS FIR - Needles: 3/4"-1 3/8", flat, pointed but not stiff and sharp, growing from all sides of the twigs, mostly blue-green. Cones: 2"-3" long; the 3 pointed bract sticking out between scales of cones is a distinguishing feature. Bark: Gray to gray-brown, deeply furrowed, corklike.

COTTONWOOD and **ASPEN** - Buds of cottonwoods are resin-coated and sticky, bark is dark, rough and furrowed. Buds of aspens are not sticky and bark is smooth and almost white.

WILLOW - Leaves: from 1"-5" long and usually narrow, finely toothed, green and often shiny. Twigs: Smooth, usually shiny; green, yellow, orange or brown. Flowers: small, in dense cluster. Some willows have flowers that are fuzzy and silver.

RED ALDER - Leaves: 2"-5" long, sharply toothed or with many rounded teeh. Bark: Thin, gray to red-brown, not papery, with small, raised rough spots. Fruit: appears in groups of 3-5 woody cones (look like miniature pine cones).



Low Hells Canyon Dam
SNAKE RIVER
To Black Lake
North Star Butte
To Kinney Pt.
Horse Mtn.
(KG)
Kleinschimidt Grade
Cuprum
(C)
Bear
BEAR CREEK
Homestead
(R) Recreation Area
Hatchery
Oxbow Dam
Oxbow
(O)
LICK CREEK
To New Meadows
To Halfway
PINE CREEK
Sheep Peak
Lafferty Campground
(L)
95
WILDHORSE RIVER
CROOKED RIVER
Peck Mtn.
McCormick Campground
Brownlee Dam
Crooked Rv. Point (6929')
BROWNLEE LAKE
Cuddy Pt. (7715')
(BG)
Beggs' Picnic Area
E. BROWNLEE CREEK
Brownlee Campground
(B)
Council
95
71
WEISER RIVER
Cambridge
95
To Indian Valley
To Weiser

Shrubs of the Snake River Canyon and Mountains

BITTERBRUSH - A much-branched evergreen shrub 2-10 feet tall, commonly growing with sagebrush, and in spring densely covered with light yellow, roselike flowers. Leaves: numerous and small, about ½ in. long. Location: Dry soil of valleys, hills and mountains to around 9,000 feet.

ELDERBERRY - A large shrub, 3-10 feet tall. Small white flowers are arranged in clusters, 2-3 in. across. Later in season, flowers give rise to small bright red berries. Leaves: opposite, compound. Flowering season: June and July. Location: Moist to wet soil along streams, in woods and open areas, from valleys to around 10,000 feet.

SERVICEBERRY - The most common early white-flowering shrub in Canyon. The 5 white petals are narrow, usually twisted and about ½ in. long. Leaves: 1"-2" long, oval in outline, toothed above middle or sometimes all around. Flowering season: April to June. Location: Moist soil along streams and in mountains to about 7,500 feet.

CHOKECHERRY - A large shrub or small tree up to 25 feet tall. Flowers small and white. Leaves: elliptic and 1"-4" long with fine teeth around edges. Flowering season: May and June. Begins to flower about time Serviceberry has completed flowering. Location: Moist soil along creeks in valleys and on hills and mountain sides to 8,000 feet.

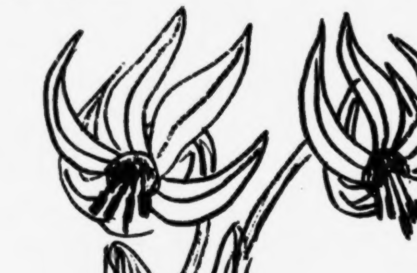
WILD ROSE - This is a shrub 3-10 feet tall, usually with prickly, branched stems. Flowers: a great deal of variation in size and color. Flowering season: latter part of May, through June and July. Location: In moist soil of draws, hillsides along streams, and in open valleys. Occurs from valleys to about 7,000 feet.

POISON IVY - An erect shrub, 2-6 feet tall. Shiny leaves are composed of 3 leaflets, each ovate in outline, 2-4 in. broad and borne near end of stems. Small greenish-white flowers occur in dense clusters close to leaves. Flowering season: May and June. Location: Moist creek banks and rocky crevices in woods, plains, valleys and foothills. Note: to most people this shrub is poisonous to touch due to a toxic oil produced in all parts of the plant. Poison ivy and poison oak are the same plant; the only difference depends on the habitat which determines whether it is a vine or a shrub.

Wildflowers in the Snake River Canyon and Mountains

Note: The symbols after the description indicate in which area the flower was observed. (See page 68)

AVALANCHE LILY – A yellow lily with 2 large, shiny oblong basal leaves. One to several flowers occur on long, usually naked stems. Flowering season: at low elevations first appears in early April, soon after the snow recedes, and blooms for about a month. Height of flowering season at 8,000-9,000 feet is early July. Other names: Dogtooth Violet, Snow Lily, Adders-Tongue. KG to C.



Avalanche Lily

ARROWLEAF BALSAMROOT - In spring, flower often colors dry hillsides bright yellow. Resembles a sunflower and stalks attain a height of 8-24 in. with flowers 2-4 in. across. Leaves are large, pale-green and arrow-shaped. Flowering season: latter part of April to first part of July. It occurs in dry soil of valleys and hills, and in mountains to around 8,000 feet. Other names: Bigroot, Big Sunflower. Throughout Canyon and open mountain fields.

BALSAMROOT - Related to the Arrowleaf (above), but has knotched leaves that are hairy. Flower is yellow and sunflower-like. Grows low to the ground. Throughout Canyon and mountains.

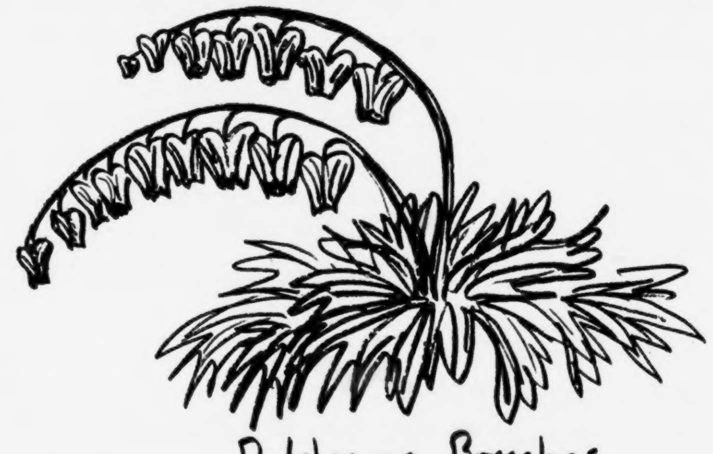
BISCUITROOT (WYETH) - A plant of dry areas whose small yellow flowers radiate from the same point, each on a small stem. This formation forms a open, lacy flower cluster. The leaves are parsley-like. Flowering season: latter part of April to latter part of June. The plant is found in dry hills and plains. Throughout Canyon and mountains.

BUTTERCUP (SAGEBRUSH) - A bright shiny yellow flower, turning white with age. Flowering season: This is the first buttercup to appear in spring, blooming in valleys and mountains just as snow recedes. Throughout Canyon and dry mountain slopes.

BLUEBELL (MOUNTAIN) - A low, small leafy plant, 4-8 in. high, with light blue, dropping tubular-shaped blossoms. Un-opened blossoms have a pink cast. Flowering season: early spring blossoming in valleys and foothills, later in higher elevations. KG, C, L.

DANDELION - Yellow rayflowers on leafless, hollow stalks. Flowering season: from early spring until late fall. Found everywhere in moist to wet soil of fields, thickets and open meadows. Throughout Canyon and mountains.

DUTCHMAN'S BREECHES - This flower resembles a pair of bloomers turned upside down. Blossoms vary from white to pinkish in color. 10-20 blossoms hang along the stalk, youngest flowers at the top. Leafless stalk is 1-2 ft. tall. Leaves are basal and appear almost carrot-like. Flowering season: April-May. They begin to appear soon after snow recedes among foothills, below ledges and in places where soil is loose and sliding. Also, along shaded stream. KG.



Dutchmans Breeches

GRASS-WIDOW - These plants usually grow in bunches with stems 6-12 in. tall. Flowers are about 1 in. wide, bright pinkish–purple. A six-petaled flower with grass-like leaves. Flowering season: early spring. Found in higher elevations in open, rocky meadows amongst coniferous forests. Other names: Purple-eyed Grass. C to L.

HOLLY-GRAPE (OREGON-GRAPE) - This is a low shrub that seldom grows more than 1 foot tall. It has clusters of bright yellow flowers in the center of holly-like leaves. The leaves appear leathery and are evergreen. Flowering season: latter part of April to July. Found in moderately dry soil of woods and hills. Occurs from valleys to around 9,000 feet. B, KG, C, L.

INDIAN PAINTBRUSH - This plant appears as a brilliant red flower. The red stain on the cluster of leaf tips near the flower is characteristic. Most flowers are red, but some are yellow. Leaves are narrow and grasslike at the base, or cut into narrow segments. Flowering season: late spring until end of July. Found in dry to moist soil of plains and mountains, from lower valleys to 9,000 feet. KG.

LUPINE - Plant with long spikes of blue pealike flowers. The flowers are small and cluster about the stem halfway up. The leaves are basal with 5-11 leaflets. Flowering season: from May until July, in moist soil of pine and aspen woods, open hillsides and meadows to timberline. Found in Canyon and mountains.

LARKSPUR - Larkspur has 3-10 blue-purple flowers about ½ - ¾ in. long. Blossom has a tubular spur that protrudes sidewise from flower. Plant is 6-24 in. tall, generally with unbranched stem. Flowering season: from April to July. Found in valleys, foothills and on dry ridges and flats to 10,000 feet. All along Canyon, KG, C.

PHLOX - Flower characterized by symmetrical, 5 petaled blossoms. The petals are flat. White phlox is a low, mat-forming plant with white to lilac flowers. Long-leaved Phlox is upright, rather than mat-forming and generally has a larger, pink flower. Phlox is frequently found blooming in conjunction with Arrowleaf Balsamroot. Flowering season: April through July, depending upon elevation. Grows in dry to medium-moist soil of open forest, ridges and grassy areas from foothills up to around timberline. B, C.

SUGARBOWL - A dull purple, fuzzy, sugarbowl-shaped flower. About 1 in. long and ¾ in. broad. Single flower at the end of each stem. Main characteristic is fuzziness of blossom. Flowering season: latter part of April to June. Found in moist open areas of plains, hills and woods to about 8,000 feet in the mountains. B.

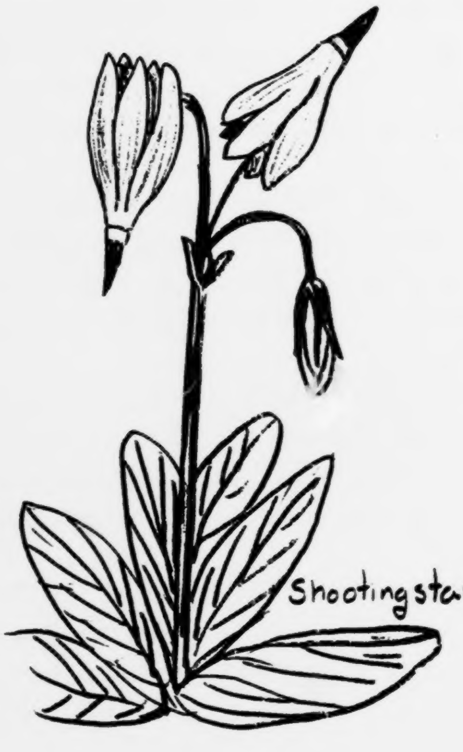
STARFLOWER - This white to pinkish flower has a slender unbranched stem 8-10 inches tall. There can be 3-6 flowers at the top of each stem. The petals are ¼-½ in. long and are deeply clefted, thereby resembling a star. Flowering season: March through June. The plant is found in medium-dry soil, from lowest valleys to about 9,000 feet. Throughout Canyon, KG.

SPRINGBEAUTY - These are delicate pink to white flowers, from 6-12 in. high. Each flower has 5 petals which are veined with deeper pink when examined closely. Each plant has one pair of opposite stem leaves and usually one basal leaf. Flowering season: at low altitudes starts blooming in early April and continues blooming in higher altitudes until mid-August. Found growing in moist soil from valleys to alpine regions (10,000-11,000 feet) KG, C.

SHOOTINGSTAR - Petals are bright rose-purple, ½-1 in. long and flare backward. Fused stamens form a beak pointing downward. Flowering season: latter part of April through July. Found in moist to wet soil in open places of plains, hills and mountain sides. Range from valleys to 12,000 feet. KG.

VIOLETS - Violets look like miniature pansies. There are many varieties of Violets, colors ranging from purple to bronze and yellow. Flowering season: April through July. These plants are generally found in wet soil, by streams, springs and boggy areas. Found throughout Canyon and mountains.

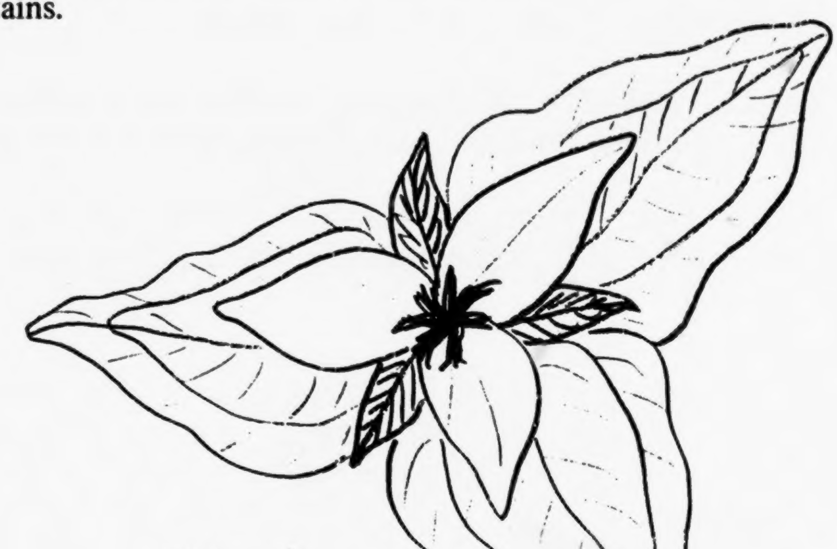
WATERLEAF - The flowers of this plant have globular heads of purplish-white hue. The petals radiate around the short stalk and the stamens extend beyond the petals. The leaves, which are taller than the stalk bearing the flower, are broad and divided. Flowering season: April through June. This plant is found in moist soil, along roads, gullies and canyons up to 9,000 feet. Throughout Canyon (not in profusion) and in mountains.



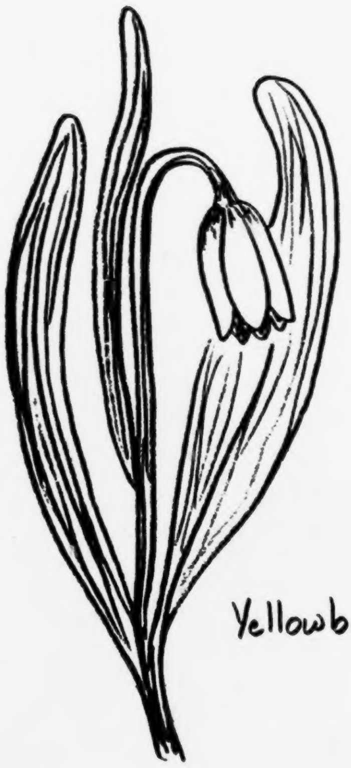
WILD HYACINTH - This plant is characterized by blue, tubular-shaped flowers. The stems are very long, 1-3 feet and the rather inconspicuous leaves are grasslike and shorter than the stem. The flowers are at the tip of the stem and radiate from a central point, which can contain 5-15 flowers on each short stalk. Flowering season: April to early July. The plant grows in dry to moist soil, often in rocky areas, meadows or open woods of valley, hills and in mountains up to 9,000 ft. KG.

WAKEROBIN (TRILLIUM) - This is a beautiful white flower, characterized by 3 petals which have in back of them three green leaves. This is a single flower plant. The entire plant is from 8-10 in. tall and is conspicuous because of its large white petals. Flowering season: as soon as snow disappears, the Wakerobins push out of the earth - they are among the first harbingers of springs wherever they grow. Their habitat is generally damp woods or boggy areas in partial shade. They grow in these areas from valleys up to 7,000 feet. C.

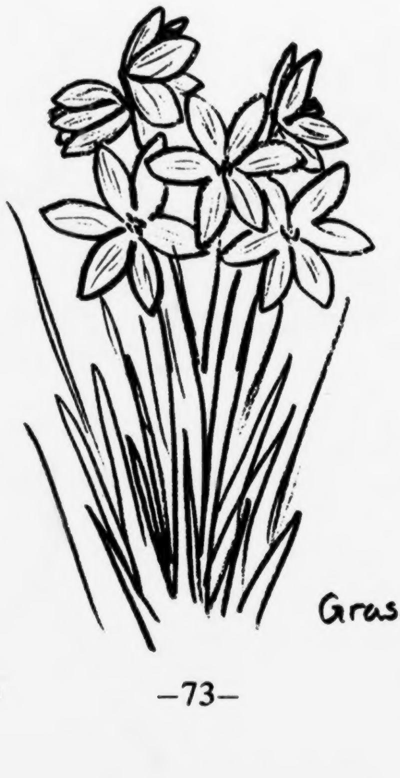
YELLOWBELL - This plant usually has a single golden-yellow flower, bell shaped, whose stalk is bent so that the flower hangs downward. There are 3 petals. The plant is 3-8 inches tall with unbranched stem and 2-6 narrow leaves. Flowering season: one of the earliest flowers of spring, commencing to bloom the middle of March in valleys and continuing until late June in higher mountains. These plants are found in sagebrush areas, dry hillsides and mountains to elevation of 9,000 feet. Throughout canyon and mountains.



Wakerobin



Yellowbell



Grass-Widow

Birds of the Snake River Canyon and Mountains

CHICKADEE, BLACK-CAPPED - Chickadees are small, active birds patterned with dark caps, black bibs and white cheeks. Habitat: Mixed and deciduous woods, willow thickets and groves. B.

CHICKADEE, MOUNTAIN - Similar to Black-capped, but black of cap interrupted by white line over each eye. Habitat: Mountain forests and conifers. B, L.

BLACKBIRD, RED-WINGED - Male: a jet-black bird with red shoulder patches. Female: brownish, identified by sharp-pointed bill. Habitat: Common during spring and summer. Throughout Canyon and mountains.

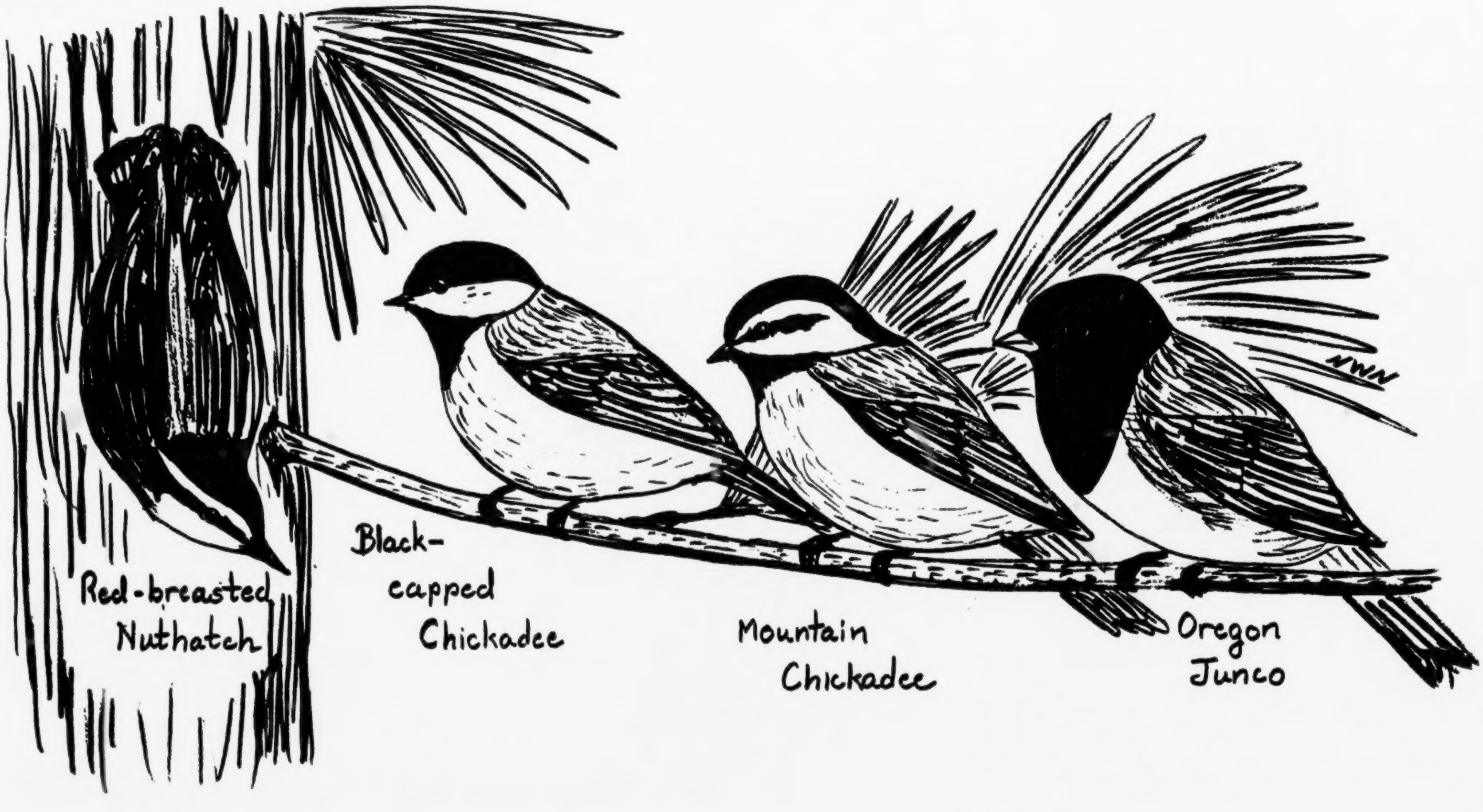
BLUEBIRD, MOUNTAIN - Male: turquoise blue, belly whitish; Female: dull brownish with a touch of blue on rump, tail and wings. Habitat: scattered trees in open conifer forests. C, L.

CHUKAR - Grey-brown with bright red legs and bill, resembles a sandy-colored Quail. Habitat: Rocky, grassy or brushy slopes, arid mountains and canyons. Present throughout Canyon.

CROWS - Large, completely black bird. Often in large flocks. Habitat: Woodlands, farmland, river groves, shores. Common throughout Canyon.

EAGLE, GOLDEN - A very large blackish hawk with golden-brown crown and hind-neck. Habitat: Open mountains, foothills, canyons and plains. Present in Canyon, although scarce.

GOLDFINCH - Male: A small yellow bird with black wings; forehead and tail black. Female: Olive-colored with similar markings. Habitat: River groves, willows, poplars, orchards and roadsides.



FLICKER, RED-SHAFTED - A large woodpecker with brown back and wings barred by black. Conspicuous white rump, this and brown back, mark it as a flicker. Habitat: Groves, river woods, open forests; most common in cottonwood, aspen and poplars. B, L.

GROUSE, RUFFED - A grayish-brown chicken-sized bird with a black band at end of tail. Note fan-shaped tail. Habitat: Mixed or deciduous woodland. B.

HAWK, SPARROW - A small swallow-like falcon, size of a jay. No other small hawk has a rufous back or tail. Habitat: Open country, prairies, wooded streams, farmland. Along Canyon and in mountains though not in great numbers.

JAY, STELLAR'S - A dark-colored blue-black jay. Slightly larger than the robin, with a long tail and a pointed crest. Habitat: Conifer and pine-oak forests. L.

KINGLET, GOLDEN-CROWNED - Kinglets are tiny active, olive-gray birds. This species shows a conspicuous bright crown patch bordered by black and a white stripe over the eye. An upward flip of the wings is distinctive in recognizing kinglets. Habitat: conifers. B, L.

KINGLET, RUBY-CROWNED - This kinglet has broken white eye-ring and male has a scarlet crown patch – usually concealed except when excited. Any kinglet not having a conspicuous crown patch and eye-strip is of this species. Habitat: conifers. L.

MAGPIE - Magpies are the only large black and white land birds in North America with long wedge-shaped tails. Habitat: Foothills, ranches, sagebrush, river thickets. Found throughout Canyon in abundance.

MEADOWLARK - A short-tailed bird, smaller than a robin generally, with brown upper parts streaked with black and yellow underparts crossed on breast with a black V-shaped collar. A conspicuous patch of white on each side of its short, wide tail. Habitat: open fields, meadows, prairies and plains. Throughout Canyon.

OREGON JUNCO - Male: A small rusty-backed bird with a black head. Female: Head grayer, rusty of back not so sharply defined. Habitat: Conifers and mixed forests. B, L.

PINE SISKIN - A small, sparrow-sized brownish bird, heavily streaked, yellow showing in wings and tail during flight. Habitat: Coniferous forests, mixed woods, alders. B.

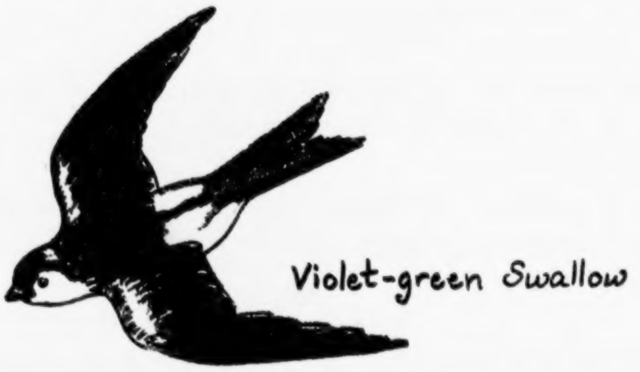
ROBIN - A familiar bird recognized by gray back and brick-red breast. Habitat: Throughout year inhabits many areas: farmland, open forests, streamsides, etc. In all areas exhibiting signs of early spring.

RUFOUS-SIDED TOWHEE - A robin-like bird. Male: head and upper parts black with numerous white spots on wings; sides reddish and belly white. Female: similar, but dusky brown where male is black. Habitat: Brush, undergrowth, forest edges, city shrubs. B.

RED-BREASTED NUTHATCH - A small nuthatch with black head and white line over eye; rest of upper parts bluish-gray; under parts, including throat, reddish brown. Habitat: Conifer forest. L, B.

SAY'S PHOEBE - A large flycatcher with a dark-brown head, grayish breast and reddish brown belly. Habitat: Open arid country, brushy plains, canyon mouths, Homestead, Oregon.

SPARROW, SONG - The "small brown sparrow" of backyards, brushy areas, and semi-open woods. Rusty or grayish brown above, streaked on back with darker brown; underparts white streaked with brown. Throughout Canyon.



SWALLOW, VIOLET-GREEN - Characterized by white patches that almost meet over base of tail; crown and back dark green, nape and rump violet. Habitat; Widespread when foraging. Throughout Canyon.

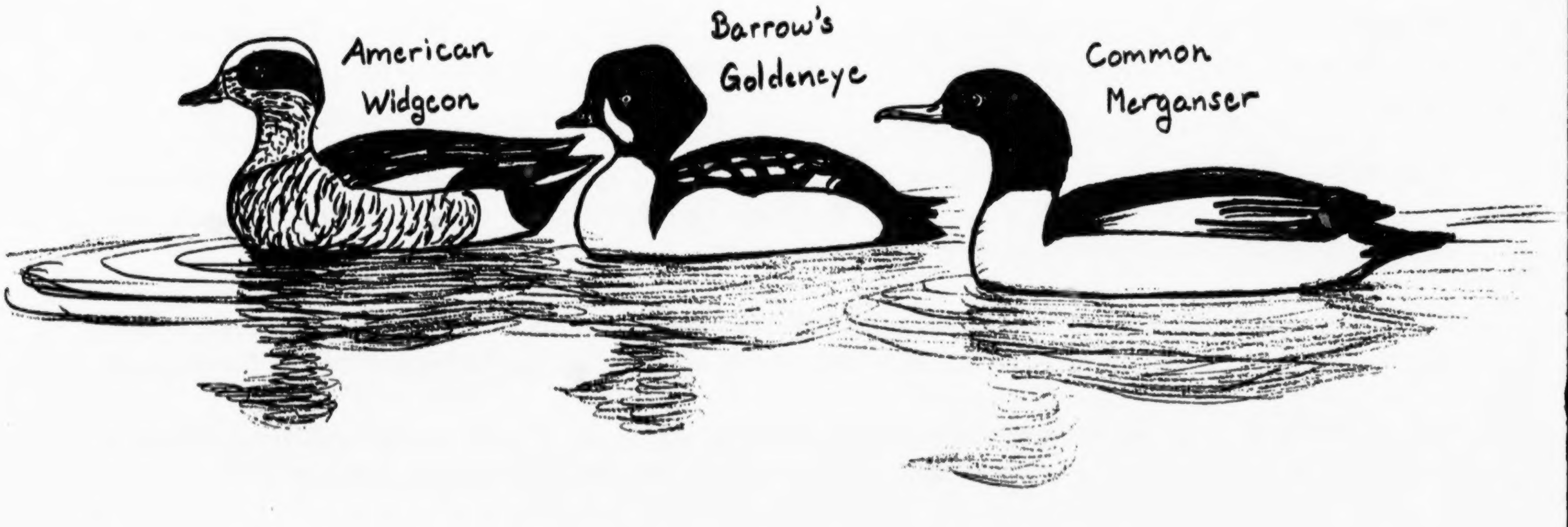
TOWNSEND'S SOLITARE - A rare, slim gray bird almost robin size. A white eye-ring, white sides of tail and a buffy wing patch. Habitat: mountain forests, canyons, brushy slopes, juniper.

Water Birds of the Snake River Canyon

AMERICAN WIDGEON - A small brown flecked duck. Identified by white brow strip on male and pale orange breast - both sexes. Note white wing patches and white bellies visible during flight. R.

BARROW'S GOLDENEYE - Medium-small duck, head appears large. Male has black head and back, with white breast, cheeks and bands on wings. Female is a grayish bird with a rusty-brown head. Along Snake River.

CANADIAN GOOSE - Large water bird - very common along Snake River. Note black neck and head with conspicuous white throat patch. Along Snake River.



GREAT BLUE HERON - Large gray-blue bird - stands on stilt-like legs. Neck is long and bill extends looking like a spear. When flying the legs hang out behind, neck is crooked up against body. Feeds on fish and frogs along the river's edge. Along Snake River.

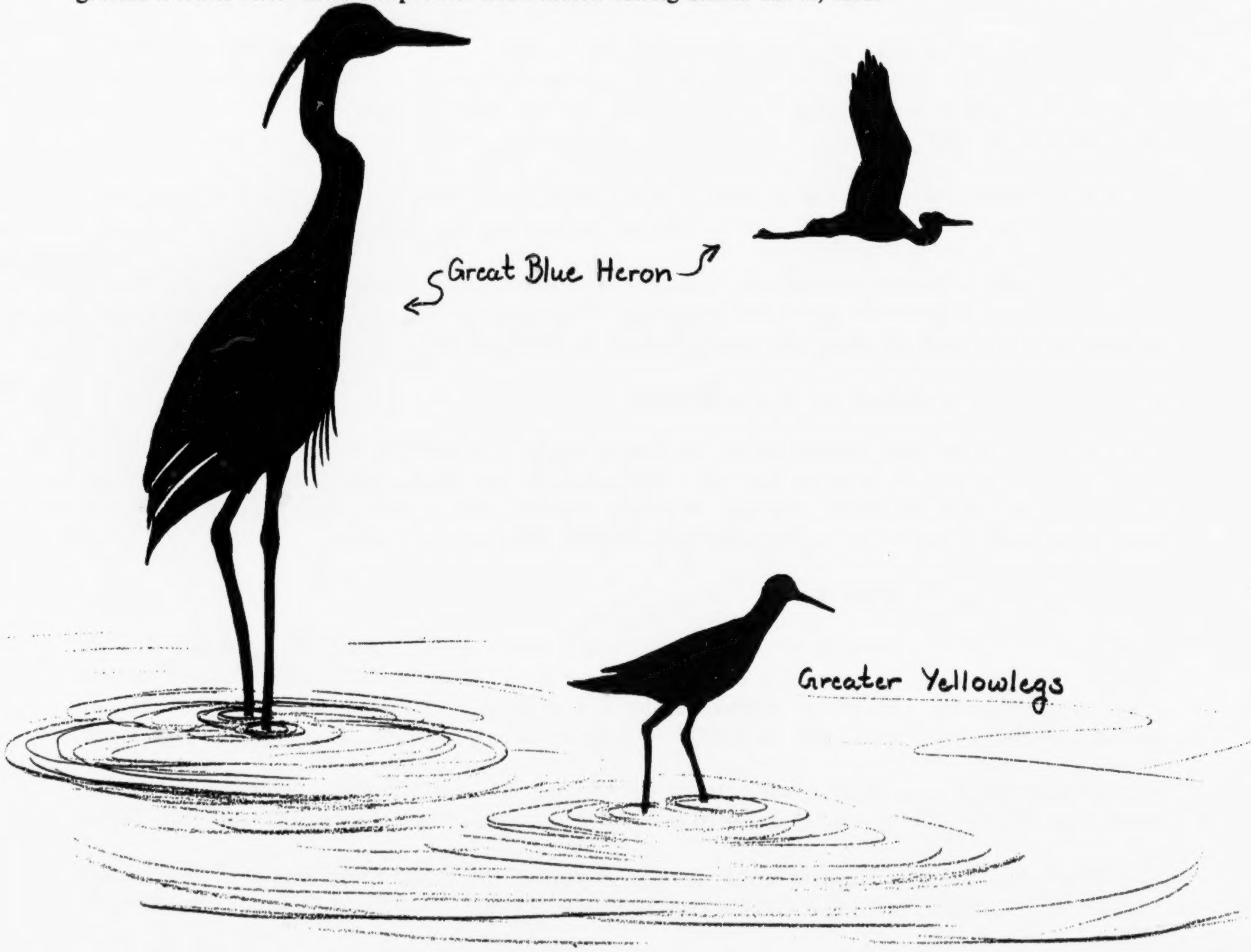
GREATER YELLOW LEGS - A gray-white speckled sandpiper-like bird. Legs are long and bright yellow. Migrates through Canyon during the spring and fall on its way to and from Northern Canada. Along Snake River, rare.

GULLS - Large, sleek white birds. Seen commonly flying above river or floating on the water. Can frequently be seen diving for fish. Along Snake River, common.

MALLARD - Common medium sized duck. Male noted by green head and gray-silver back. Female is inconspicuous brown and white flecked. Along Snake River, common.

MERGANSERS - A slim, medium sized duck. Male has green head, dark back and white underparts. Female is grayish with rusty head and white breast. The slim shape distinguishes them from the Goldeneye. Along Snake River, abundant.

WOOD DUCKS - Very shy, small and compact ducks. Multicolored, but male's head appears dark greenish. Both sexes have sweptback head crests. Along Snake River, rare.



Mammals of the Snake River Canyon and Mountains

BAT – The many varieties of these "truly flying mammals" are difficult to distinguish. These animals are most frequently seen in the evening or night and generally feed on insects. Most of the common bats in this area are no bigger than a sparrow. Although lacking true wings, their arms and hands have been modified to resemble a wing-like structure. They generally flutter rapidly while in flight.

CHIPMUNK – A small, rusty brown squirrel-like mammal, distinguished by the black and white striped pattern on the back. They have a wide geographical range and the variety of types can be seen from brushy, semi-open areas to dense forests. B, C.

GROUND SQUIRREL, COLUMBIAN – This bushy-tailed ground squirrel has a mottled gray body. He can be distinguished by his reddish-brown feet and snout. Body length 10-12 in. These squirrels are found living in colonies in wooded areas. B, C.

MARMOT, YELLOW-BELLIED – These marmots, also known as Rock Chucks, are frequently seen among the rocks. They have a yellowish-brown body with yellow belly and usually white between the eyes. The sides of the neck have buffy patches. The length of the head and body is from 14-19 in. Found throughout Canyon, easily seen from the road.

MULE DEER – This deer is found in forests and brushy-rocky areas. It is reddish in summer, blue-gray in winter. The ears are large and the whitish rump can be easily seen when animal is running. The tail is either black-tipped or black on top. Can be seen throughout Canyon and generally are very shy.

RABBIT – This active mammal is easily distinguished by its long ears, long hind legs and short cottony tail. Both jack rabbits and cotton-tails are common in this area. C.

RIVER OTTER – This large weasel-like mammal is rich brown above with a silvery sheen below. It has small ears and a broad snout. Its head and body can be from 2-4 feet long. Due to over hunting of this animal, all otters are now protected in the Snake River Canyon. Oxbow Lake.

GEOLOGY OF THE SNAKE RIVER CANYON*

From Hells Canyon Dam upriver nearly to Weiser, Idaho, the floor of the canyon is flooded by water impounded by three dams recently constructed by the Idaho Power Company. These are, from south to north, Brownlee, Oxbow, and Hells Canyon. Paved roads along the three reservoirs connect Brownlee Dam on the south with Hells Canyon Dam on the north.

FAREWELL BEND TO OXBOW

At Farewell Bend, the Snake River leaves the lava and sediment-filled Snake River Plain and winds through an open, mountainous area characterized by long narrow ridges, V-shaped canyons, and steep, predominantly soil-covered slopes cut by a multitude of draws and gulches. The canyon gradually deepens until it is 2,000 to 3,000 feet deep at Oxbow. Here the river makes a 180° bend.

A few miles below Oxbow the river enters Hells Canyon, the deepest gorge in North America. For more than 60 miles the canyon is 4,000 to 6,000 feet deep, as measured from the west rim. To the

---

*Adapted from "Progress Report on the Geology of part of the Snake River Canyon," **The Ore Bin**, Vol. 29, No. 12, December, 1967, Oregon Department of Geology, by Howard C. Brooks and Tracy L. Vallier east the highest peaks of the Seven Devils Range tower nearly 8,000 feet above the river. From promontories such as Hat Point on the west rim and Kinney Point on the east wall, one sees a vast panorama of angular erosional features stepping precipitously down toward the river below. Nearly vertical cliffs, narrow benches, talus slopes, and sharply incised side canyons characterize the terrain. The river channel is generally narrow and in many places is deeply entrenched between sheer rock walls.

Although there is little or no mining at present, deposits of gold, silver, copper, and gypsum have been commercially exploited in this region in past years. In addition, there are important limestone reserves in the Connor Creek and Big Bar areas.

Before the Snake River Canyon existed, the Blue and Seven Devils Mountains were partly, if not entirely, buried by Miocene basalt flows of the Columbia River Group. These lava flows poured out on rugged, mountainous terrain, accumulating to a thickness of thousands of feet in low places and forming a vast plateau. During Pliocene time the mountains were uplifted by folding and faulting, and much of the lava has since been eroded, exposing ancient metamorphic and igneous rocks beneath. For much of its length, the canyon of the Snake River has been cut through the plateau-forming basalts and deep into the old mountains. The profile of the old land surface beneath the lavas is visible at many places in the canyon.*

Rocks exposed on the canyon walls are volcanic and sedimentary. A wide variety of plutonic rocks represent at least two major stages of intrusive activity. The bedded rocks include thick sections of Paleozoic phyllite, chert, argillite, greenstones, and limestone; Middle and Upper Triassic volcanic flows, limestone, and conglomerate; and Upper Triassic-Jurassic slate.

The older group of plutonic rocks includes gabbro and quartz diorite: these have been highly folded and metamorphosed. The younger plutonic rocks, probably of Cretaceous age, are mainly granodiorite.

The Tertiary lava consists mainly of a great number of flows of brownish olivine basalts. These have in most places been only gently warped and are relatively little altered.

The basalt flows are more than 2,000 feet thick at Brownlee Dam. Metamorphosed pre-Tertiary rocks crop out in two places along the road between the Brownlee and Oxbow Dams. About 2 miles north of Brownlee Dam, pre-Tertiary rocks rise nearly 1,000 feet above the river on the Idaho side of the canyon. Metamorphosed quartz diorite, gabbro, and diorite are sheared along northeast-trending faults. Limestone and argillite are faulted against the plutonic rocks. These bedded rocks dip steeply and in places are folded.

Miocene volcanics are at river level for about 4 miles between pre-Tertiary rocks. Some basalt tuffs of Miocene age occur along the road. About a mile south of the Oxbow, near the mouth of Warm Springs Creek, travertine deposits jut out as white shoulders against the somber browns of the basalt.

The Oxbow of the Snake River is a conspicuous feature that is characterized by abrupt bends and straight segments. It was probably carved when the river was superimposed from the overlying Columbia River basalt onto the pre-Tertiary rocks. Two wind gaps, representing former stream channels, cross the ridge of the Oxbow. The long, straight segments of the river are controlled by a set of pre-Miocene faults. Rocks of the older intrusive complex are metamorphosed.

*Refer to Table 3, Stratigraphic Names, **Idaho Earth Science**, Ross and Savage, p. 7

OXBOW, OREGON TO THE KLEINSCHMIDT GRADE

For the first 1½ miles north of Oxbow along the road, the rocks are bluish-green flows and tuffs cut by blackish-green dikes. These rocks may be of Permian age or older.

Near Homestead a section of Middle Triassic rocks, consisting of graywacke, volcanic rocks, and limestone is faulted into the Permian strata. Permian rocks are best exposed in the Homestead area and near Ballard Creek. Volcanic rocks, conglomerate, argillite, and limestone are the dominant rock types. Vertically graded tuff units, from 1 to 50 feet thick are common. Conglomerate beds reach thicknesses of more than 40 feet.

KLEINSCHMIDT GRADE TO BIG BAR

Permian rocks, well exposed on the Kleinschmidt Grade, continue to crop out along the road for about 2 miles to Limepoint Creek. Here a fault or series of faults separates upper Triassic and Permian rocks. About half a mile northeast of the mouth of Limepoint Creek, a fault slice of Upper Triassic limestone is exposed as a white peak. A fault slice in Eckels Creek is composed of limestone and separates Permian from Triassic strata.

From Limepoint Peak to Big Bar, Middle and Upper Triassic rocks are exposed in a complex anticline. Upper Triassic red and green volcanic rocks form jagged and rugged outcrops. Middle Triassic strata weather to low shoulders and smooth slopes.

The Upper Triassic Formation forms canyon walls on both sides of the Snake River at Big Bar. More than 1,700 feet of limestone and dolomite are exposed along the south side of Kinney Creek. The calcareous rocks yielded plastically during deformation, but the underlying volcanic rocks ruptured.

Big Bar, a major topographic feature on the canyon floor, has a composite origin. River-bar gravels interfinger with alluvial fan materials that were eroded from the canyon wall. A landslide which originated on the opposite side of the river capped the bar and formed a hill that stands nearly 200 feet above the river.

A major fault separates Permian and Upper Triassic strata about one mile east of Big Bar at least 10,000 feet.

BIG BAR TO HELLS CANYON

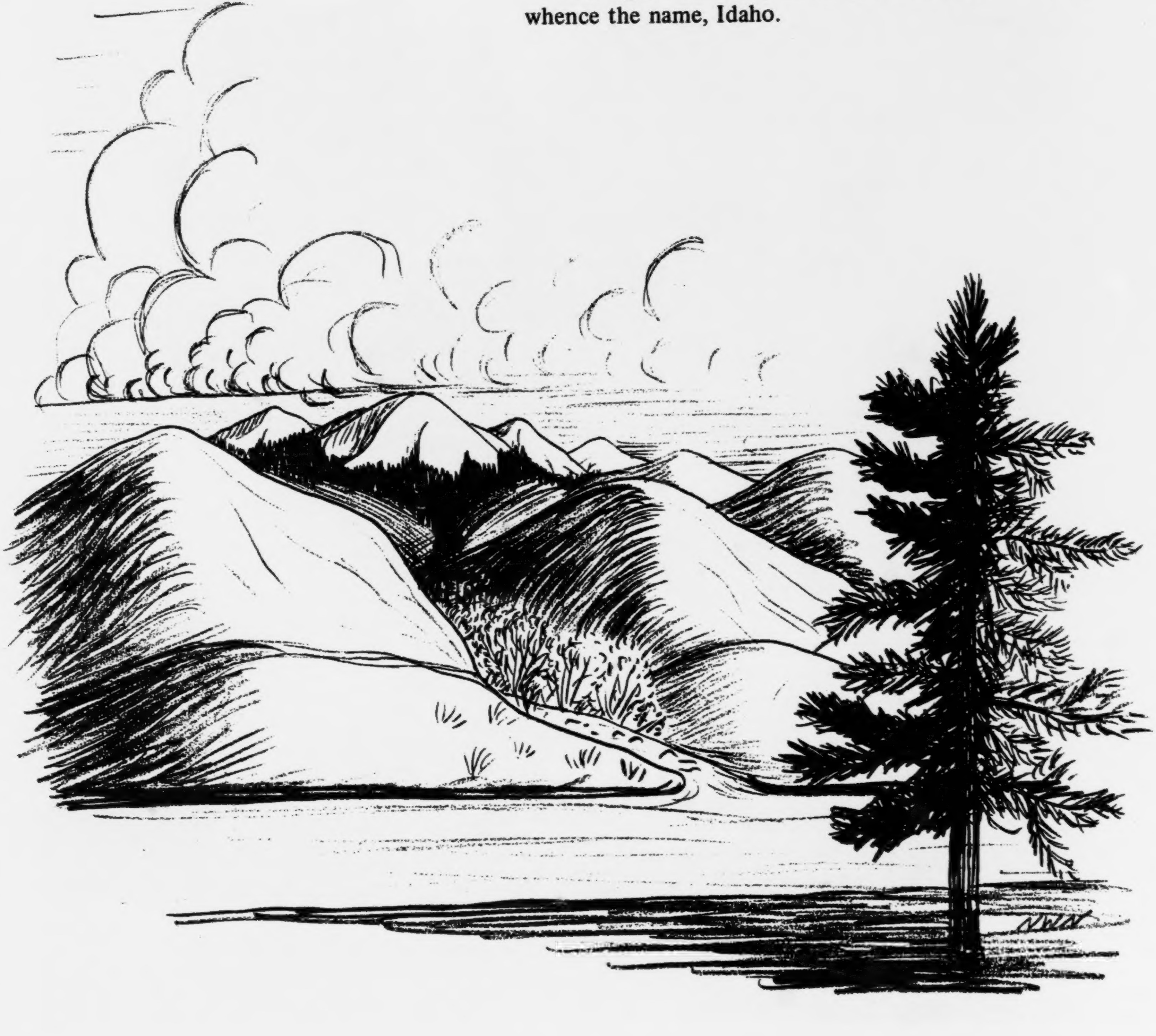
Most of the rocks between Big Bar and Hells Canyon Dam are of Middle and Late Traissic age. One exception is a small slice of Permian rocks exposed across the river from the mouth of Doyle Creek. Structural trends are northeast and beds dip to the northwest. Repetition of beds by faulting probably is responsible for the thickness of the strata.

HELLS CANYON TO LEWISTON

The canyon continues to deepen near Hells Canyon Dam and beyond, until it reaches a depth of about 6,000 feet. The geology of this area has not been studied extensively because of the difficulty of access. The section from the lowest dam to Lewiston (about 100 miles) includes the most rugged and inaccessible part of Hells Canyon. Commercial boats run upstream from Lewiston to the mouth of the Salmon and beyond if the water is high enough, but there are no roads down to the river until it reaches Lewiston, where the banks rise less than 50 feet above the Snake River.

The Snake River Canyon is just one of the many unique natural resources present in Idaho.

The Canyon vividly epitomizes the Indian description – "the light is coming down the mountain" – from whence the name, Idaho.



(Photo courtesy Bob Lorimer)

THE BASS POND COMMUNITY

By Barbara Littlejohn – Nancy Norseen

- **Weiser, Idaho**

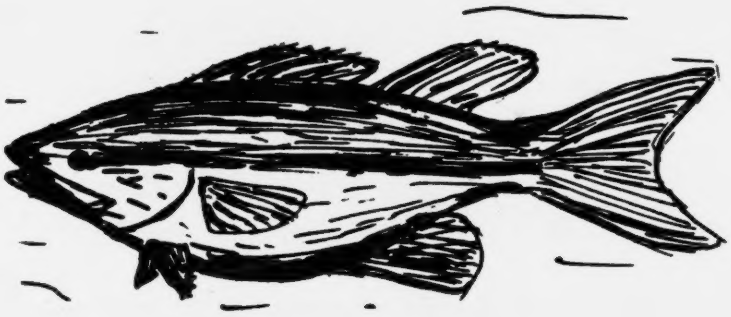
HISTORY

The Bass Pond has been used for rearing fish for over 50 years. Springs which flow from the bank on the north side produce optimum conditions for raising young fish. These springs have a constant temperature of 53 degrees Fahrenheit. During "horse and buggy days" this spot was a prime watering stop.

The Washington County Wildlife Club has maintained this area since its value for rearing fish was realized. This organization had the pond extended to its present size by the construction of a high dike between the river and the springs. Trout were originally raised here. It was then turned over to the rearing of Largemouth Bass. It is the only pond in Idaho used to raise this species. Both mature brood stock and fingerlings are supplied by the state.

One end of the pond is fenced off; in this cove large breeding stock are placed. The eggs are laid here in nests scopped out of the mud bottom and guarded by the parents. When the fry (newborn fish) hatch, they become prey to their own parents. The fence is provided to allow the young to escape into the pond proper. This rearing pond provides a rich natural food supply for the fish, mainly in the form of fresh water shrimp. When the fish are old enough, they are turned into the Snake River through a large pipe at the outlet, or may be netted and used to stock other ponds. The club provides this service for the public. Fishing will remain excellent in Idaho only as long as interested people hlep to maintain suitable conditions for raising fish.

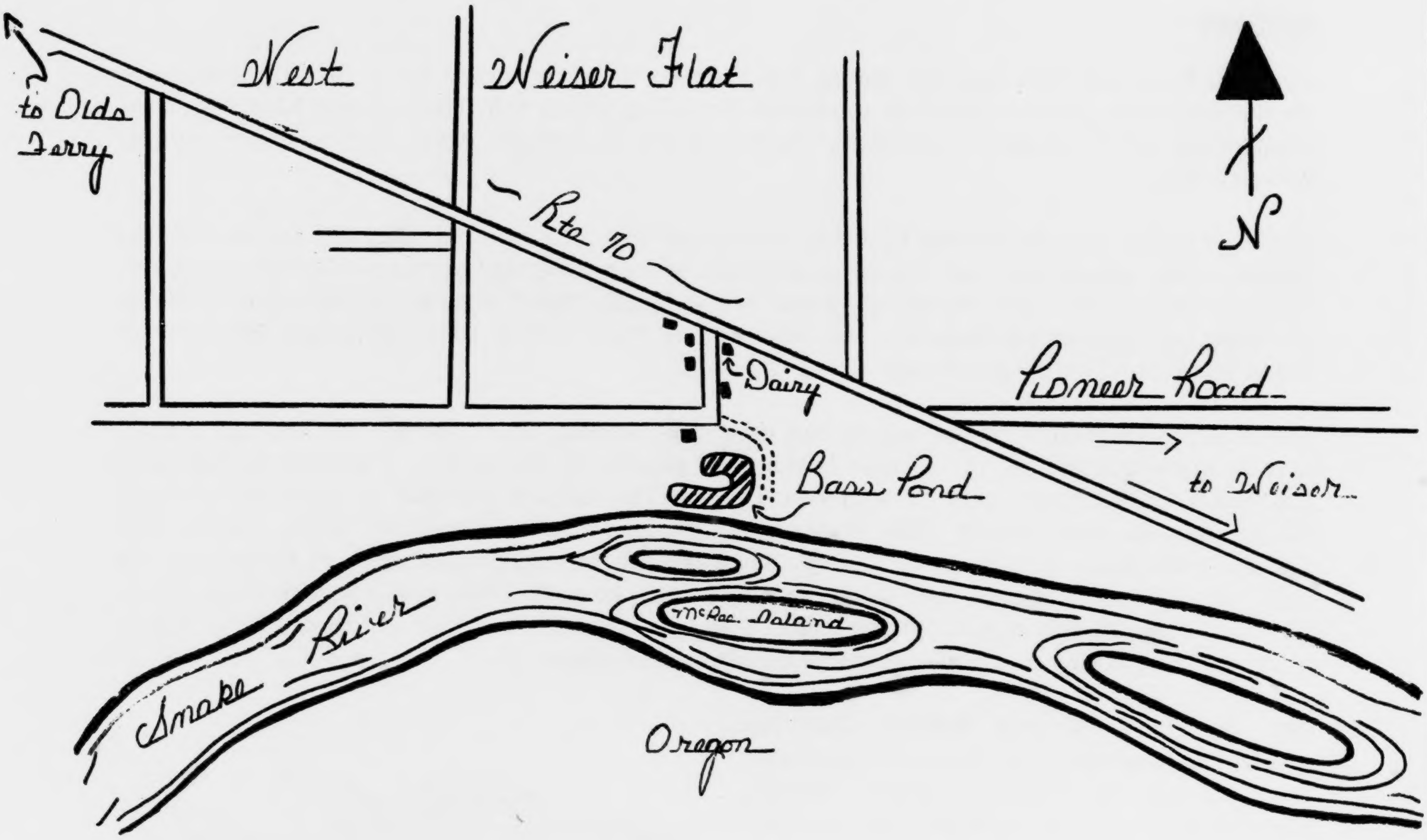
The Washington County Wildlife Club has planted various trees and shrubs to encourage other forms of wildlife. Golden willows, Russian olives and elms provide both food and cover for many song birds. Wild roses, wild asparagus and other low shrubs and grasses have been established as food and for sheltering of small animals. Naturally-growing water plants provide a rich source of food for water fowl. The Bass Pond area is now an excellent place to observe wildlife.



It has taken knowledge, forethought and time to develope this area into such a rich community. To keep it as a place where wildlife can flourish will require the cooperation and interest of many people.

LOCATION

The Bass Pond lies about 2 miles west of Weiser, Idaho, just off Route 70 (¾ mile from junction of Pioneer Road and Route 70. Turn left off Route 70 on first paved road. This will be just past the dairy (identified by large sign on the left). This road runs ¼ mile before making a sharp right turn to the west. At the corner, there will be three graveled drives. The middle one (the only road that doesn't lead to a house) leads to Bass Pond. Do not drive down this road, but park vehicle safely off the paved road and as you start walking down the gravel road, Bass Pond will be seen directly ahead.


to Olds Ferry
West Weiser Flat
Rte 70
N
Dairy
Pioneer Road
to Weiser
Bass Pond
McRae Island
Snake River
Oregon

As Bass Pond is not a public park, any visitors are required to notify the Washington County Wildlife Club, George Binning, Weiser, Idaho, before visiting. The purpose of the pond is for the rearing of Bass and fishing is strictly prohibited.

Approximately halfway down the hill turn right and enter through barbed wire gate.

The road follows a high bank above the pond.

At this point, note wire screen spanning two banks of the pond.

Below and to the left of the road one can see a spring fed creek containing Watercress.

Shortly after passing a corral on the right, the road starts downhill.

As the road descends, note steep bank rising on the right for Bank Swallow burrows. These nest-burrows have been made by the swallows and are lined with grass. Here they raise their young.

As you approach the pond, it is often possible to see many ducks and birds. These animals are very shy, so proceed quietly.

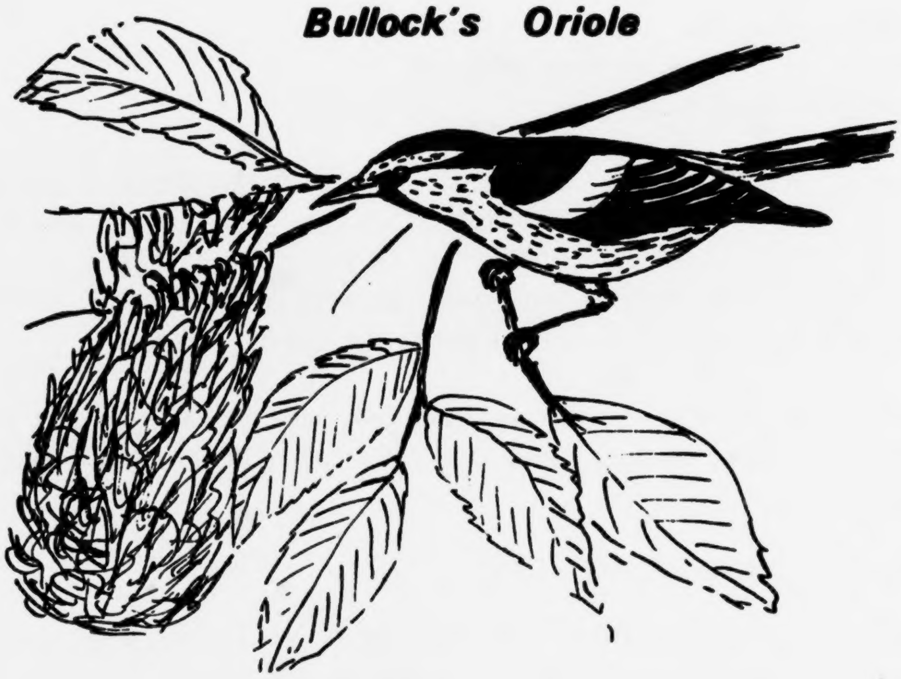
At the bottom of the hill, turn left and start exploration of the central grassy peninsula.

The first thing to note on the peninsula is the tall elms on the left. Grey hanging nests can be seen on many branches. These nests are built by the orioles.

The vegetation on and around this area is typical of a pond community. High grasses, cattails, and small willow trees are easily recognized.

While on the peninsula, a large variety of birds can be observed, including Magpies, sparrows and Redwing Blackbirds. (Types will vary according to the season.)

The peninsula is also a good place to look for Muskrat. They can frequently be seen swimming from shore to shore, eating shoots of willows and some water plants.



At the outer-most point of the peninsula, a clump of prickly red stemmed roses can be observed. Cup-shaped bird nests can be noticed among the branches.

Other types of animals that can be seen in the late spring and summer are frogs, toads, snakes and a large variety of insects.

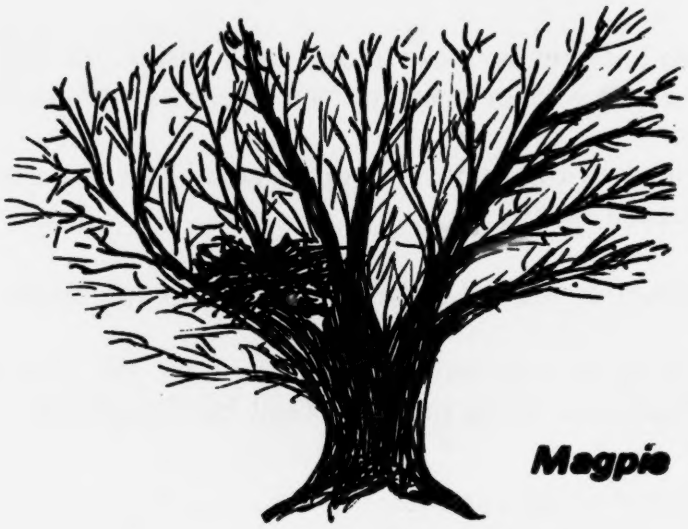
While on the peninsula, it is a good time to explore the shore or bank. As is characteristic of many slow moving bodies of water, the banks have an accumulation of low brush and grasses. Can you think of any aminals that might benefit from the material collected along the bank?

If you stand quietly along the bank, you may see many water animals. These water inhabitants include the Bass, tadpoles and many small creatures including insects and shrimp which the Bass feed on. Here again there is a seasonal variation in what can be observed.

As you leave the peninsula and turn left, a small inlet stream is on your right containing watercress. The watercress is a source of food for ducks. This stream provides a source of water for the pond. Notice the device used for controlling this inlet.

The path leaving the peninsula is lined with large willow trees. Notice the Magpie nests which are large structures made of twigs and sticks among these trees.

As one walks along the high dike, the river appears to the right. It is at this point that the river and the pond can be closely compared. Note the plant differences. Is the water level on the pond and the river the same? Can you think of ways the water level of both bodies can be changed? Which body of water appears clearer? Can you think of why?



Magpie Nest

Along the dike a large vine grows which in the winter is easily identified by a net-like pod. In the fall, the pod is green and prickly. This vine is commonly known as the western wild cucumber.

As the path leaves the pond, you can hear running water. To the left is the outlet gate. This gate is used in regulating the water level in the pond.

The path then passes through an open gate and joins a dirt road. Between the road and the pond grows a dark, glossy-barked tree called the Russian olive. The small fruit provides food for many birds.

NOTES TO THE OBSERVER

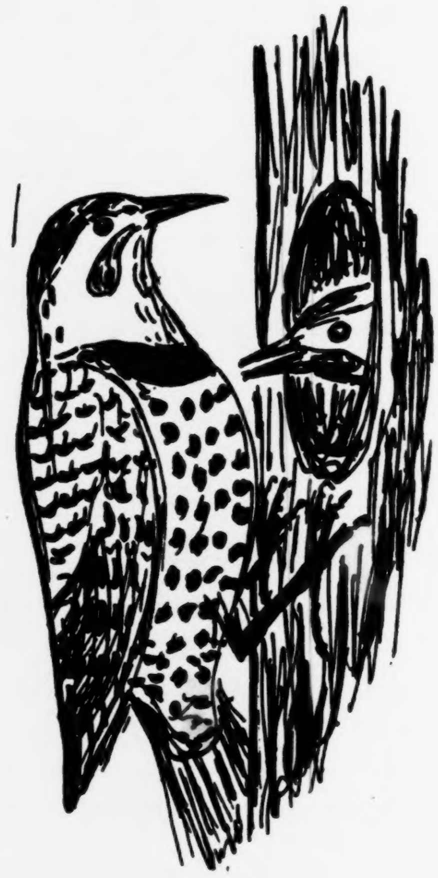
The Bass Pond area has been referred to as a community because it is an area where a fairly large number of different kinds of animals and plants live together under similar conditions. Many depend on each other for their livelihood.

When observing this community, it is important to notice the terrain, or landscape, and the plant life. This information will often give a clue as to what animals will be found in the area. For instance, whenever you find large growths of cattails you can expect to find muskrats. The reason for this is that the muskrat's main source of food is the cattail. Be aware of the animal homes. For example, a small hole in a tree can mean that any number of animals might be near. The flicker makes holes in dead parts of the tree for homes. Other animals, such as squirrels and some mice often move into an old woodpecker house. A good observer does not disturb the home but waits to see who comes and goes. Holes in dry, steep banks are generally the homes of the bank swallow. Muskrats also burrow holes in the ground, as do some kinds of mice, rabbits and other small animals, including snakes. Therefore, it is unwise to stick your hand down any hole.

When you visit a community such as Bass Pond, you will find many kinds of animals and plants, but not an over abundance of any one kind. If a certain type of animal or plant becomes too extensive, the entire community is in jeopardy. A community such as Bass Pond is carefully balanced. There is just enough of each kind of plant and animal so that everything can live comfortably. An example of this cooperative existence can be seen in the activities of the oriole. Orioles eat caterpillars that can destroy trees and other plants if not controlled. In this way the oriole helps the plant life while getting food for its family. If we are not aware of how a natural community is balanced, then we can often destroy its beauty and resources without knowing it.

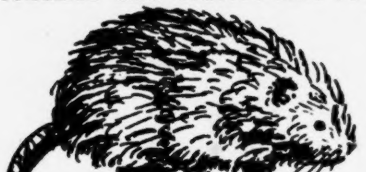
Bird nests are often as easy to recognize as the builder. The orioles build hanging nests, building a new nest each year in which to raise their families. The nests are so well built that they last for several years. Since a pair of orioles, like many birds, return to the same spot each year, one can frequently find a tree with several nests, all built by the same pair of birds in succeeding years. Other birds, like sparrows, robins and blackbirds, build cupshaped nests amongst the branches of trees or bushes. These nests can be identified by their size and the materials that were used to build them. Some birds use grasses, sticks or feathers in the construction of their nests, while mud is a substance frequently employed to hold the nest together.

An available source of food is one of the main requirements for any wild animal. Some feed on insects, other on seeds, in fact practically every part of a community is important to some animal living there. If too many animals feed on the same kind of food, then there will not be enough of that kind of food to go around.



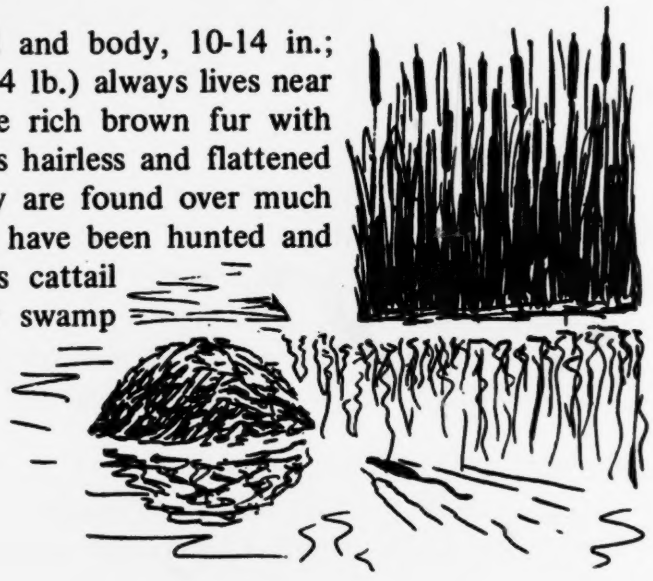
Red-shafted Flicker

A first step in understanding an area like Bass Pond is to observe without disturbing any of the plant or animal life. When you do this, you are the student and the entire community is the teacher and classroom. A good observer can come away with a wealth of interesting information.

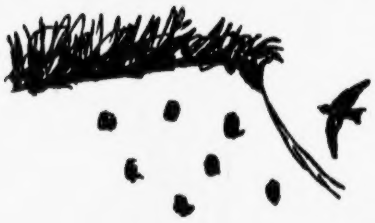


Muskrat

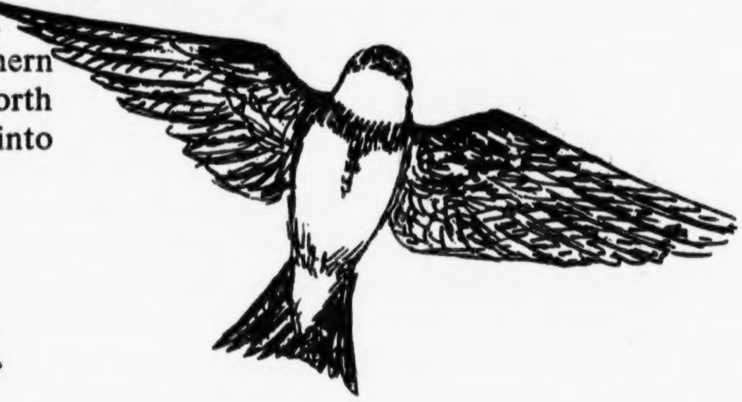
This large rodent (head and body, 10-14 in.; tail, 8-11 in.; weight, 2-4 lb.) always lives near water. They have dense rich brown fur with silvery belly. The tail is hairless and flattened from side to side. They are found over much of North America and have been hunted and trapped for their valuable pelts. Their main diet is cattail roots and stalks. They may also eat several other swamp plants, some clams and fish.

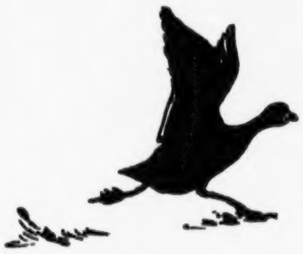


Bank Swallow



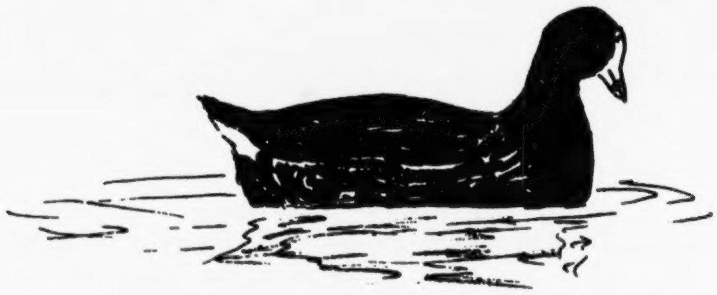
A small brown backed swallow with a distinct dark breastband, whose flight is irregular and more fluttery than other swallows. Their voice is a dry chitter or rattle (brrt or tri-tri-tri). They winter in South America, Africa, and Southern Asia. In summer they are found throughout North America where they nest in colonies, burrowing into steep banks near water. (See map for nest location.)





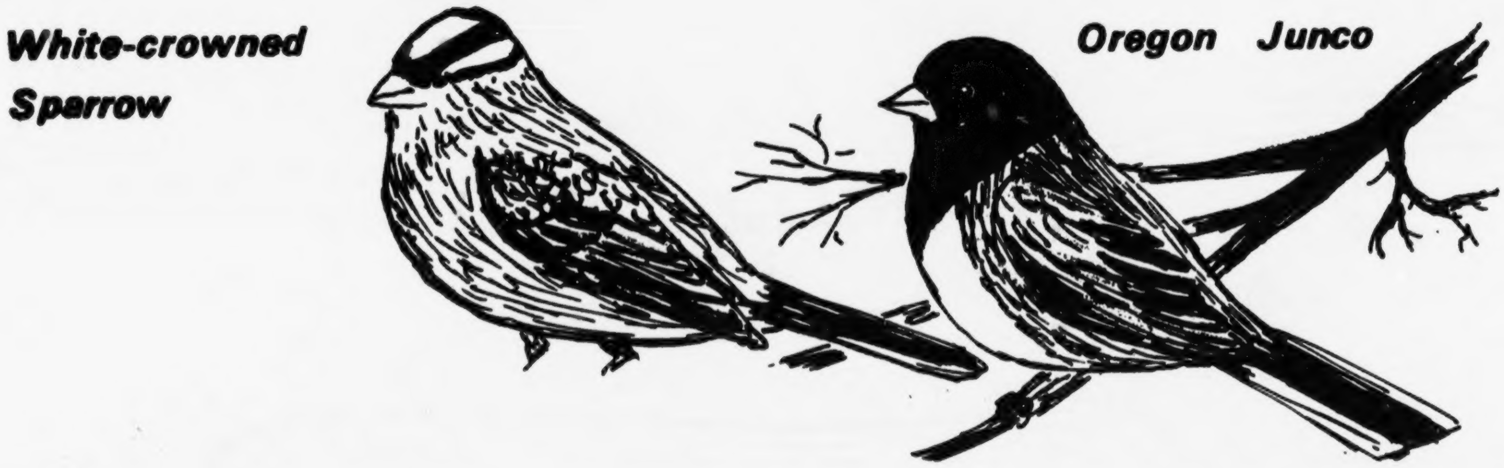
American Coot

A slate-grey ducklike bird with a white bill. In nesting season they are found on fresh water throughout the United States, in winter on both fresh and salt in warmer regions. They feed along the shore, on the surface of the water and under it. When taking flight, they appear to be walking on the water. When flying their feet extend beyond the tail.



List of Birds Observed at Bass Pond

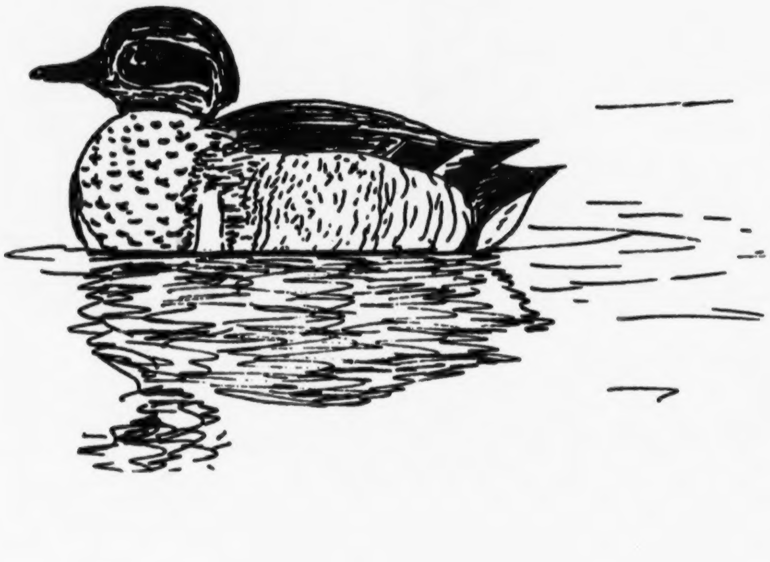
	Illustration
WATER BIRDS –	
HORNED GREBE *(Podiceps auritus)*	Page 92
CANADA GOOSE *(Branta candensis moffitti)*	Page 195
MALLARD DUCK *(Anas platyrhunchos)*	
CINNAMON TEAL *(Anas cyanoptera)*	
GREEN-WINGED TEAL *(Anas carolinensis)*	Page 89
AMERICAN COOT *(Fulica americana)*	Page 88
GROUND BIRDS – (GAME BIRDS)	
RING-NECKED PHEASANT *(Phansianus colchicus)*	
CALIFORNIA QUAIL *(Lophortyx californius)*	Page 178

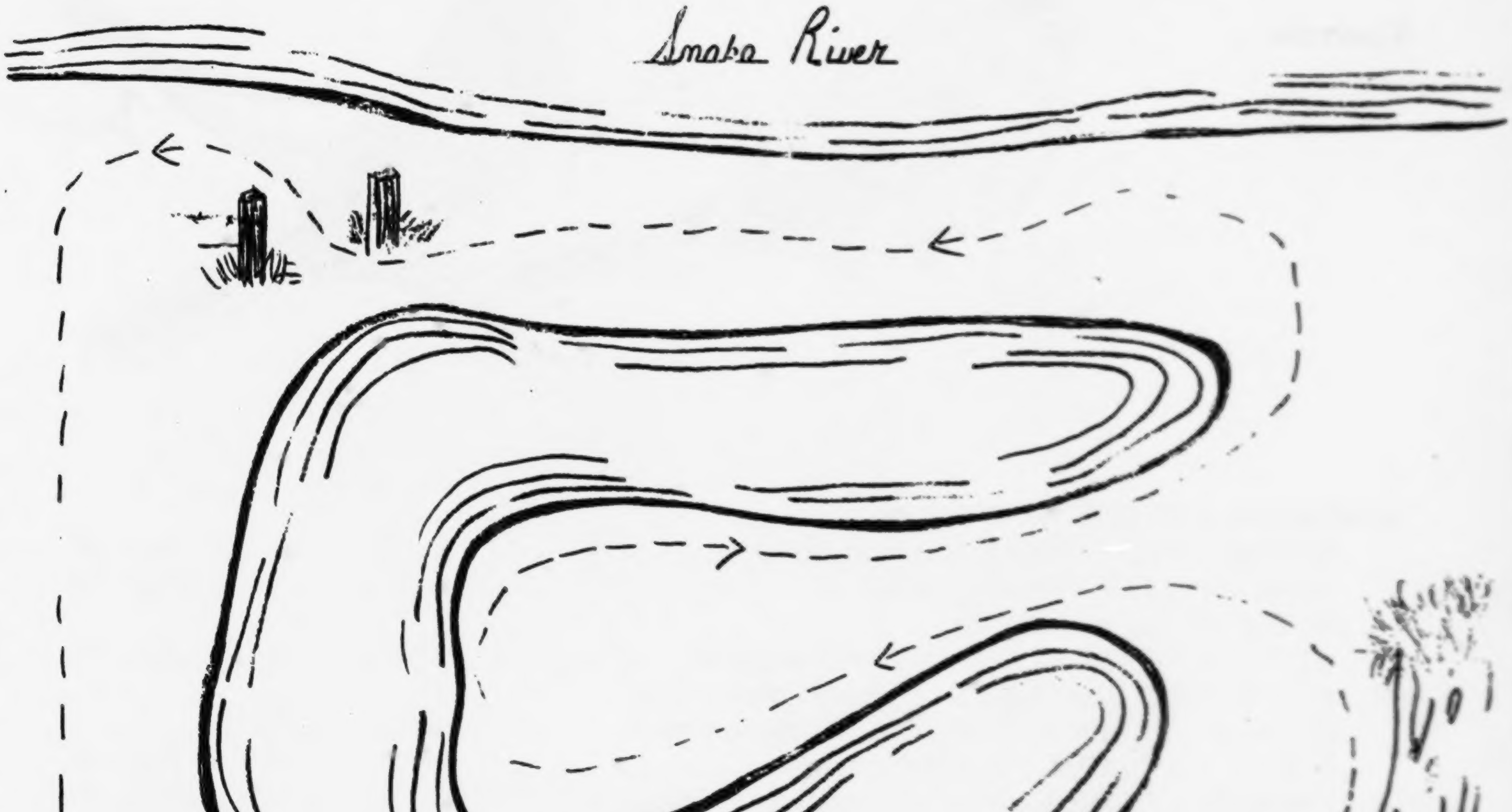


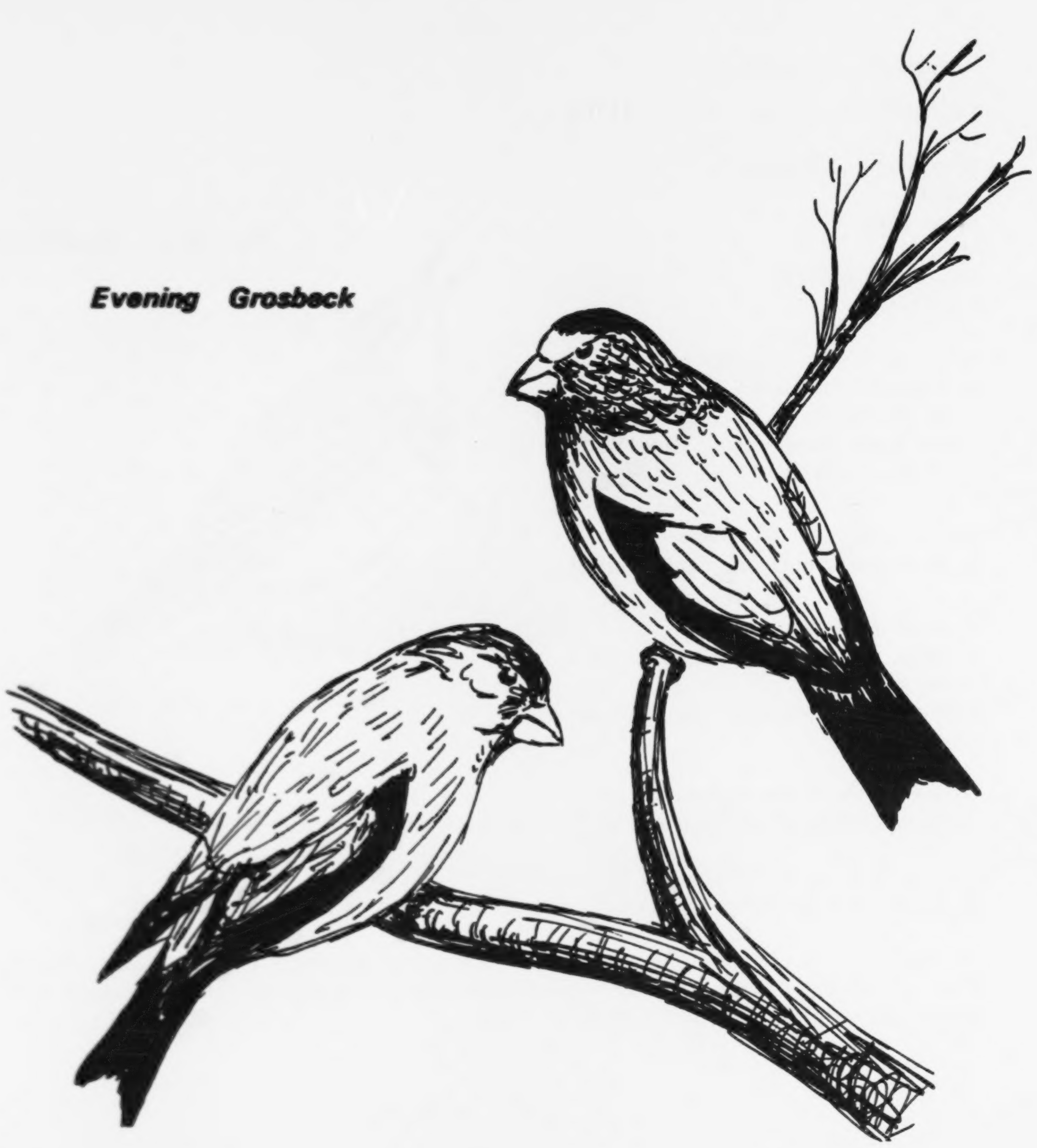
SONGBIRDS AND PERCHING BIRDS –

RED-SHAFTED FLICKER *(Colaptes cafer)*	Page 87
BANK SWALLOW *(Riparia riparia)*	Page 88
ROBIN *(Turdus migratorius)*	
WESTERN MEADOWLARK *(Sturnella neglecta)*	Page 92
RED-WINGED BLACKBIRD *(Agelaius phoeniceus)*	
BREWER'S BLACKBIRD *(Euphagus cyanocephalus)*	
BULLOCK'S ORIOLE *(Icterus bullockii)*	Page 85
EVENING GROSBEAK *(Hesperiphona vespertina)*	Page 91
OREGON JUNCO *(Junco oreganus)*	Page 89
WHITE-CROWNED SPARROW *(Zonotrichia leucophrys)*	Page 89
SONG SPARROW *(Melospiza melodia)*	
BLACK-BILLED MAGPIE *(Pica pica)*	

This list includes species observed at Bass Pond during the winter, 1968. As such it is not a complete list of all birds in the area, but can serve as a guide as to what might be observed. Helpful field guides are included in the references. In order to observe birds more closely, binoculars are a helpful tool.




Snake River
Start



Questions for the Observer

1. What are the major differences between the Snake River and Bass Pond? Can you think of how these will affect the plant and animal life in both places?

2. As you observe Bass Pond, what are the various food sources available for the animals that live there?

3. Bass Pond was built and is maintained by interested persons. In what ways has man jeopardized the natural beauty of the area?

Bibliography and References

Golden Nature Guides (Price – $1.00)
Birds
Butterflies and Moths
Insects
Insect Pests
Mammals
Non-flowering Plants
Pond Life

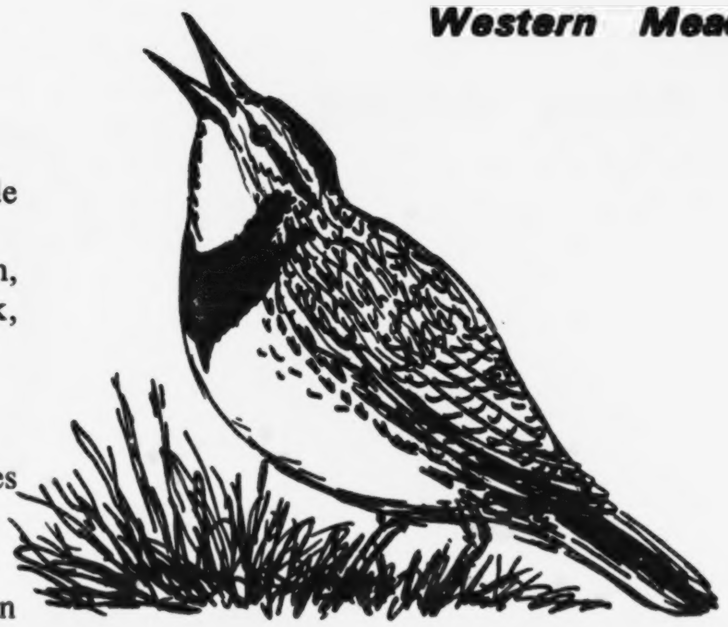
American Wildlife and Plants: A Guide to Wildlife Food Habits
A. C. Martin, H. S. Zim, A. L. Nelson, Dover Publications, Inc., New York, 1961 (Price – $2.50)

Audubon Western Bird Guide
R. H. Pough, Doubleday Nature Guides

Birds of North America
Robbins, Bruun, Zim, Singer, Golden Press – (Price $2.95)
Note: This is an excellent handbook for identifications.

A Field Guide to the Mammals
Burt and Brossenheider, Houghton Mifflin Company, 1956

A Field Guide to Western Birds
R. T. Peterson, Houghton Mifflin Company, 1961 – (Price $4.95)


Western Meadowlark

Acknowledgements: Credit and thanks for information pertaining to Bass Pond to Mr. George Binning, Washington County Wildlife Club. Thanks also to DeLance Franklin, Research Professor of Horticulture, University of Idaho, Moscow, Idaho.

Horned Grebe

THE IDAHO ALMADEN (Mercury) MINE

The mine is located on top of Nutmeg Mountain, (elevation 3700 feet), which is a prominent, flat topped spur that projects from the upper eastern rim of the valley of Bear Creek, a tributary of the Weiser River. Nutmeg Mountain is part of one of a series of broad anticlines (upfolds) running in a northwest direction – this particular anticline being 35 miles long. This area has been faulted and folded producing a depression near the center of the Mountain and it is in this depression that the mercury ore (cinnabar) is located. It occurs in the Miocene Payette formation – lake sediments consisting of ash, shale, and sandstone, overlain originally by Columbia Riber basalt and Idaho formation of later Pliocene and Pleistocene times. These later layers have been eroded away at the site of the mine although there are outcrops of basalt a few hundred yards to the east.

Discovered in 1936, mercury was first produced here in 1939. The ore consists of cinnabar with abundant opal and chalcedony in about equal amounts. In most of the ore, the cinnabar is so finely divided it gives only a faint pinkish color. In most places the veins are much less than a millimeter in width although there are some 3 millimeters thick. In general, the cinnabar produces irregular splashes, streaks and mottlings of pink and red against a background of nearly white opal and grayish blue chalcedony. This outcrop escaped detection for a long time, because cinnabar tarnishes to a dull blue-black when exposed to air and sunlight; the characteristic red color is seen only on fresh surfaces. The ore contains from 5 to 15 pounds of mercury per ton, 0.01 to 0.02 ounces of gold per ton and traces of pyrite.

The deposit is believed to have formed from hot alkaline solutions that rose close to the surface and deposited their load at temperatures between 100°C and 150°C. As the solutions permeated the sandstone beds, they apparently dissolved and removed a large part of the rock and filled the openings with a silica gel that set as opal. Next, an even greater volume of opal and some cinnabar were deposited in fractures and openings. This mineralization took place after the Idaho formation (Pliocene and Pleistocene) had been folded, so it must be younger than Pleistocene, and must have occurred just before or during the early stages of the present cycle of valley cutting erosion.

If you wish to visit this mine, you should first contact the manager by writing to P.O. Box 627, Weiser, Idaho, or by phoning him at the mine, 549-0224, Weiser, at least one week ahead. Guided tours of the mercury extracting plant and open pit may be arranged. Refer to study trip guide for more information.

0.0 Start mileage at Weiser Hospital on East Park Street, which becomes River Road. Go east.

0.2 Pass Park School on hill to the left.

5.6 Junction. Mann Creek Road enters from the left. Continue straight ahead. Don't turn off River Road. The road is now following the Galloway Canal.

7.8 Chinchilla Ranch to the right.

9.2 Good view of dikes straight ahead.

10.3 Pavement ends. Railroad and Weiser River to the right. Note rock formation in road cuts to the left.

11.7 Cross bridge over Weiser River.

11.8 Junction. Sign pointing to El Paso Natural Gas Co.
To Idaho Almaden Mine

Take road to the right – it starts to climb. Bear Creek to the right. The white buildings of the mine are visible on the high ridge, Nutmeg Mountain ahead.

13.5 Junction. Rancher's road goes off to the left. Don't turn. Keep on the main road.

14.2 Junction to the right. Keep left – head up the hill toward the mine buildings.

16.3 Stop at the mine office for further instructions.

For further information on this mine and its history see: Geology of the Idaho-Almaden Quicksilver Mine Near Weiser, Idaho by Alfred L. Anderson, Idaho Bureau Of Mines, pamphlet 55, April 1941 or U.S. Bureau of Mines Circular 7800 by Margaret R. Lickes, 1957.

BOISE VALLEY

by Dr. Patricia L. Packard
Department of Biological Sciences, College of Idaho, Caldwell, Idaho

ROUTE

This tour begins at the west edge of Caldwell at the Boise River Bridge on Interstate 80N and goes north for two miles before turning east on Highway 44 which goes straight into Boise.

INTRODUCTION

Canyon Hill

To the right of the starting point is Canyon Hill, a series of small basalt lava flows that probably came from a fissure nearby. Basalt can be recognized usually by its black color and its tendency to form layers. This is because it is very hot and liquid when it comes out and flows over the ground in thin sheets.

The basalt of Canyon Hill is apparently Pleistocene, much younger than most of the lava flows of the Boise Valley, which are generally Pliocene or older. At one time, the lava was probably buried by gravel deposits and the Boise River was at a higher level, as can be seen by the height of the river terraces. The river must have had great eroding power to cut a canyon through the hard basalt.

This is probably the canyon for which Canyon County is named. At any rate, it is the closest thing to a canyon in the county and in 1892 when it was organized, the center of population was in the Lower Boise-Caldwell area, so this is probably the origin of the name.

Canyon Hill Cemetery, located on top of the lava flow, dates back to 1868, before the town of Caldwell (1892). Many of the early pioneers are buried here.

Mundy's Ferry

Gold was discovered in the Idaho Batholith in both the Boise Basin (Idaho City area) and in Silver City in the Owyhees in 1863. Mining camps have to be fed, so in response to the market opening up, farmers moved into the Lower Boise at the same time, growing truck gardens on the broad flat plain with its high water table. This was one of the few areas in 1863 that could be developed without extensive irrigation, so it is one of the oldest communities in the Boise Valley. Boise also had its first settlers in 1863. To get their produce to market, farmers on this side of the river had to ferry it across. In the early 1860's a ferry was established near the "canyon". This apparently operated until 1883 when the railroad came.

McKenzie Cabin

In 1864, Robert McKenzie built the first cabin in the vicinity of Caldwell along the river. It was made of cottonwood logs and rock from Canyon Hill. It has since been moved to the Caldwell Park.

Vegetation

The low-growing, silvery green trees along the river are Russian olives. They are not native but went wild after being introduced and now grow wherever the water table is high. The seeds are apparently spread by birds. The tree is not really an olive and it is not from Russia.

The big, dark trees are poplars. Some are native, some are introduced and many are hybrid.

Cattle Drives

In the 1870's and 80's one of the longest of the old cattle drives passed this point trailing cattle from Oregon to the railroad in Wyoming. Cows with young were said to require 20 months for the trip.

Boise River

The Boise River drains 3,400 square miles of the central mountain region of the state.It flows out of the hills southeast of Boise, flows through the town and runs northwest across the Boise Valley to where it empties into the Snake. It is a mature river in the valley, where it has a grade of 10 feet to the mile. Its banks are low and it does not appear to be eroding its channel in spite of its grade. This may be because it is heavily laden with material eroded from the Boise Ridge. When it flows out into the valley it deposits instead of eroding.

Flood Plains and River Terraces

Highway 44 is located on the flood plain of the lower Boise River. The dry hills (unirrigated) to the north all rise to the same height and contain a considerable amount of rounded river gravel, which means they were part of an earlier flood plain of the Boise River. The once level surface has been eroded into a series of even height hills or river terraces and the river has worn down to a lower level.

The higher river terraces along here were probably formed during the Pleistocene (Ice Age) when the mountain glaciers (the ice sheet didn't reach here) were melting. The Boise River carried a large volume of fast moving water that could carry a big load of sand and gravel out of the Boise Mountains. As the river flowed out on the flood plains it couldn't carry the heavier materials so dumped them in great gravel deposits along the lower part of the river.

The smaller and slower present day Boise River has eroded down through the earlier flood plains and (before the present era of controlled rivers) wandered back and forth between the river terraces on the south of the river, leaving a broad fertile farming area.

Snake River Downwarp

The flood plains are part of the Snake River downwarp. While the Boise and the Owyhee mountains are being pushed up, the area between is sinking or downwarping. As fast as it sinks down it is being filled up with gravel and other erosion materials from the mountains and with lava flows so the valley itself never gets very deep. No one knows how deep the valley is for borings of 4,000 feet are supposed to have been made at several places and have not hit bottom. This would put the floor of the valley below sea level if the borings are accurate.

Artesian Basin

Because the mountains are pushing up and the valley between is downwarping, an artesian basin is formed in the valley. The layers of gravel, coarse sandstone, and fine lake sediments lap up against the Boise mountains to an elevation of 4,600 feet and tilt down in under the valley floor. Some layers are composed of coarse materials that conduct water very well. The upper edges of the porous rock soak up snow water on the ridge and carry it down under the valley. Impervious layers of lake silt or shale confine the water in the tilted porous layer so that it is under pressure.

If a well is drilled into this porous layer that heads back into the Boise mountains at a considerably higher altitude, the weight of the water above will push the water up the borings. There are a number of artesian wells along the Boise, but because the artesian layers are not continuous, well borings may or may not hit artesian water.

Soil

The gravels of the flood plain are covered with a fine loam which in some places is quite deep. Some of it, particularly the sandy material, was deposited by the Boise River and the fine clay material was blown in by the persistent westerly winds. Together they make a fertile loam, light enough that it doesn't get soggy. Wherever there is enough water, this level area is valuable farm land.

ROAD LOG

0.0 Begin mileage at the Boise River Bridge, Interstate 80N, west edge of Caldwell.

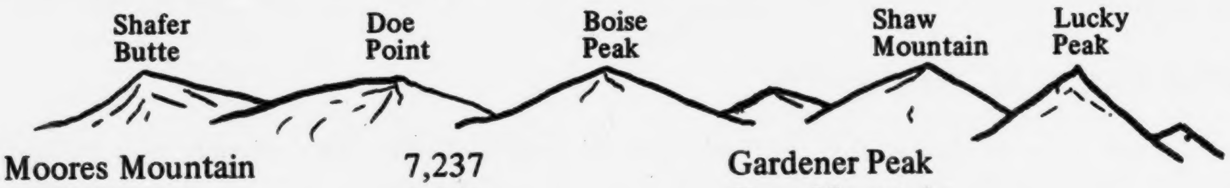
OREGON TRAIL

The main Oregon Trail followed the south side of the Boise River to near this spot where it forded the river and followed what is now the Parma Road (State Highway 20-26) to Fort Boise, established by the Hudson Bay Company in 1834 where the Boise flows into the Snake (actually this was the second Fort Boise, established in 1838 for the 1834 Fort Boise was 10 miles down the river.)

2.0 Turn right onto Highway 44, which goes through Middleton, Star and Eagle to Boise.

BOISE MOUNTAINS

The Boise Mountains are visible on the eastern horizon.



Moores Mountain	7,237	Gardener Peak	6,470
Shafer Butte	7,582	Shaw Mountain	4,800
Doe Point	7,032	Lucky Peak	5,908
Lower Point	6,102		

These mountains are the edge of the Idaho Batholith. A batholith is a huge intrusion of granite up through earlier rock. This batholith formed during the Mesozoic Age (Age of Dinosaurs) and has since been pushing up. As this area rises, the rivers become very steep, gaining great powers of erosion. They have worn away almost all the earlier sedimentary rock covering the batholith and carved it into the shape now seen.

Shafer Butte is the highest in the Boise Ridge at 7,852 feet; there is a lookout at the top. Bogus Basin Recreation Area is in the basin between Shafer Butte and Deer Point which comes out from Doe Point. The local TV towers are located on Deer Point.

There is thought to be a fault along the front of the Boise Mountains through the edge of the town. The fault has not been active during known history but if it does ever become active it could be serious. The larger buildings of Boise have not been built with earthquake in mind!

The isolated butte to the far left (north of Highway 44) is Squaw Butte. It is much younger than the Boise Mountains ahead and is a block fault mountain; a fault formed along the east side of the butte and the structure was lifted up.

WILLOW CREEK

5.0 Willow Creek arises near the old quartz mining camp of Pearl and has a drainage area of about 63 square miles. The water table in places along the lower part is close to the surface, often at a depth of 4 to 6 feet. This is why it was settled so early in the history of the Boise Valley for where the water table was high, the vegetation was green. The first settlers had come from green country and it never occurred to them that land that would grow gray sagebrush could possibly grow anything worthwhile. For this reason the first farms were truck gardens only along the river and the few streams, growing vegetables for the mining camps.

MIDDLETON

Middleton dates back to 1863 and is the second oldest town in the Boise Valley. At that time, this was Washington Territory and Indians were very much of a problem. (They thought the settlers were very much of a problem!) The original townsite was on the river but in 1881 the valley road (now State Highway 44, which you are on) replaced the Old Oregon Road and the Early Emigrant Road running north of the river, and the town moved to the present location. This probably also reduced the mosquito problem. Malaria was the biggest problem of Middleton's first doctor, perhaps due to the fact that many of the earlier settlers were from the south. It has not been able to persist here and is now almost unheard of in Boise Valley.

10.0 CENTRAL PARK COMMUNITY

This was one of the early communities of Lower Boise. The church was built in 1875 before there were any churches in Middleton and Caldwell. It was also one of the first Methodist churches in Idaho. The settlers came here from miles around on Sunday, many crossing the river in the earliest days of the Canyon Hill Ferry. It hasn't been used as a church since 1955.

11.5 ORIGINAL VEGETATION

To the left is a remnant of sagebrush along a ditch bank. Originally this was all a sagebrush flat along the river. The only green in pioneer days would have been grass, willows, and poplars along the river itself, where the water table was close to the surface. The present vegetation is the result of irrigation and of a rising water table resulting from irrigation. Many of the present plants have been introduced from other parts of the world.

15.2 MIDDLETON DITCH

In this vicinity in earlier days was a large slough. In 1863 a dam was put in the Middleton Ditch running from here to the Middleton area for irrigation. It was this ditch, which has the second oldest water right in the Boise River, that was largely responsible for the early development of the area just passed.

16.0 BOISE MOUNTAINS

Around the curve of the highway, a small basalt lava flow appears straight ahead halfway up the slope of the Boise Mountains. Just below it is a small area of red volcanic tuff (rock made of cemented volcanic ash). The lava flow is protecting the softer rock beneath it from erosion. (This can be seen in some light but not usually on a summer day.)

Notice the very sharp ecotones (transitions from one plant community to another) on the Boise Mountains. The north-tending slopes of the ridges are timbered with yellow pine or Douglas fir while the south-tending ridges are covered by grass and sage.

North slopes receive more rain and a little less sun in the summer. The difference this makes in the amount of water available to plants must be very slight, but slight differences can have drastic effects on the vegetation.

17.0 REST AREA

On the right is a grassy picnic area with a good turn out. Restroom facilities available.

19.0 DRY CREEK

This also has a drainage area of about 63 square miles.

19.5 EAGLE

On the left going into Eagle is an interesting old house built of rounded river rock. Out buildings and fence are of the same material. Eagle has other examples of early buildings; some of them are very good examples of late 1800 and turn of the century architecture, but unfortunately they aren't as well kept up as this one.

Don't miss Orville Jackson's Drugstore and Ward's What Not Shop!
A short side trip along the road going across the river at Eagle would give a good close-up view of a river terrace, showing the smooth rounded river gravel. Highway 20 to Boise goes through several good river terraces.

TERRACES

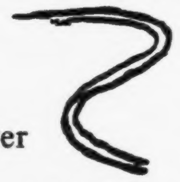
North of the road, as it leaves Eagle, can be seen river terraces at several different levels; however, the terraces next to the hills on the left are lake terraces containing fine silty sediments instead of gravel.

Table Rock is now visible below the Boise Ridge. This is the remains of another old lake terrace. The site of Boise was once under more than a thousand feet of water before the Snake River cut through the hard rock of the Hells Canyon region. The huge lake it formed was known as Lake Payette (no connection with the present Payette Lakes) and occupied this area until it finally drained during the Miocene or later (about 20 million years ago). The lake sediments are older than the river gravels which were deposited after the lake had drained.

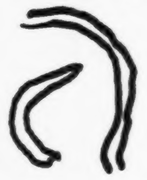
24.5 LAKE ELMORE

Behind the motel at the edge of the Plantation Golf Course is a little oxbow lake, Lake Elmore, left behind by the Boise River. This type of lake forms when a river, usually at flood stage, takes a short cut across a sharp bend or meander. These are characteristics of mature rivers:

meandering river



new course of river & oxbow lake



27.7 The big building on the right is the Idaho Department of Highways. They have a quantity of free literature in the lobby and are especially generous with teachers.

27th and State Streets. The railroad tracks appearing through the asphalt are the old Interurban tracks. This was an electric railroad completed in 1908 making a loop from Boise-Middleton-Caldwell-Nampa and back to Boise. It had hourly service. In 1928 it was discontinued but the old tracks still show up in surprising places.

The "Hat" in front of the College of Idaho was built to shelter students waiting for the Interurban.

The log ends here. The return trip to Caldwell may be made on U.S. 20, U.S. 30, Interstate 80, or you may take one of the following tours which start in Boise: the Boise River, Rocky Canyon (Aldape Summit), Horseshoe Bend, or Thorn Creek Fossil Area.

NAMPA – DEER FLAT – MAP ROCK

FIGURE 14

0.0 Begin at Nampa High School, corner of State Highway 45 and Lake Lowell Avenue, south of Nampa. From here, two interesting tours can be taken.

DEER FLAT REFUGE

Four miles to the west is the Deer Flat National Wildlife Refuge which includes Lake Lowell, an irrigation reservoir. This is an excellent area for nature study, and guided tours may be arranged by contacting the Refuge Manager, Route No. 1, Ph. 466-4811, Nampa (see study trip guide).

In the fall and winter, Deer Flat Refuge is a haven for migrating and wintering ducks and geese. These waterfowl, sometimes numbering three-quarters of a million birds, begin to move onto the refuge in September and build up to a peak in November and December. Mallards are the most abundant, followed by pintails, American widgeons, green-tailed teals, shovelers, and common goldeneyes. The large flock of resident Canada goose population nests along the nearby Boise, Payette and Snake Rivers. The geese make heavy use of forage, grain, and shoreline plantings.

Nesting marsh and shorebirds include the eared grebe, western grebe, great blue heron, black-crowned night heron and American avocet. White pelicans and common and showy egrets may be seen during the summer. Ring-necked pheasants, bobwhites, California quail and gray partridge are common residents.

Native mule deer may be seen on the east and south sides of the lake in heavy stands of cottonwood and willow. Other mammals include muskrats, beavers, weasels, minks, skunks, raccoons, porcupines, badgers, coyotes, cottontails, and blacktail jackrabbits.

Over 200,000 visitors use Deer Flat Refuge each year for various outdoor activities including hunting, fishing, boating, swimming, water skiing, picnicking, wildlife photography and bird watching. This public use is permitted to the extent that it does not conflict with wildlife requirements. Fishing and upland game and waterfowl hunting are permitted in designated areas during specified periods and in accordance with Federal and State regulations. Lake Lowell abounds with bullheads and has some yellow perch, largemouth bass and crappies.

SOUTH

To the south are many features of geologic and historic interest. Begin mileage here for tour to the south on Highway 45.

2.5 To the right (west) can be seen the east end of Lake Lowell. Gravel pits are located on both sides of the road in this vicinity. It is believed that during the Pleistocene, including the ice age, the Boise River ran south of Nampa and emptied into the Snake somewhere south of here; it has since moved its course westward and northward. The gravels in this vicinity were eroded from the Boise Mountains and perhaps deposited by the runoff water following a cold period.

The persistent dusty winds have worked over the river deposits and left thick layers of fertile eolian (wind borne) loam, 50 to 60 feet deep in places, making this a valuable agricultural area.

3.5 The road to the right, known as Lakeshore Drive, skirts part of the south shore of Lake Lowell and then joins a road which crosses the Lower Dam. From here a road follows the border of the Game Refuge along the north shore of the lake to the Upper Dam, where it joins Lake Lowell Avenue.

9.0 The prominent mound to the southwest is a shield volcano, Hat Butte. The cultivated fields on its surface are irrigated with water pumped from deep wells.

9.2 The large butte to the left (east) is Powers Butte.

11.0 Hat Butte (elevation 3,077 feet) seen from the hill, is now on the right. The smaller butte to the left is McElroy Butte (elevation 2,801 feet).

12.8 Melba junction to the left. Stay on Highway 45 which bears right. Kondo's sheds on the left and root cellars on the right.

13.2 The notched butte about 10 miles due east is Initial Point, a lava dome 175 feet high which is the starting point for the survey of all lands in Idaho. A brass cap marks the point where Township 1, Range 1, north, south, east and west meet.

13.7 On the right is a collapsed caldera (large amphitheater). A caldera is a large crater formed by the blowing off or caving in of the entire top of a volcano (Crater Lake occupies a caldera.) This one is filled with loess, a type of fine windblown silt which covers most of the southern Idaho lowlands and is very fertile due to its high potassium content. Note the pump and pond inside the crater. Although not visible from this point, basalt rims the western edge of the caldera. This was one of 40 volcanoes which extended in a line from Lizard Butte to Bruneau.

Note cinder pits on the left as the road goes down the hill to the river.

14.5 From this point on, about 500 feet of old lake deposits can be recognized beneath basalt caps nearly 75 feet thick and in the road cuts on the north side of the river. The quiet waters of a lake cannot carry particles of any size so lake deposits are fine and silty without much gravel. The soft lake sediments erode rapidly but along the north side of the river here they have been protected from wearing away by the hard layer of basalt on top.

Lakes have been frequent in this area during the past. The Snake from time to time has been dammed by lava flows, by mountains uplifting in some location downstream or by heavy loads of eroding gravel and silt. In this location the sediments are from lakes formed during the ice age but back up on top of the bluff the material is from the older Payette series of lakes dating back nearly 20 million years.

15.3 The islands in the river below are part of the Snake River Sector of the Deer Flat Refuge. This sector consists of 85 islands to the Farewell Bend, Oregon, and is an important nesting area for Canada geese; various ducks, particularly mallards, also nest on the islands. This stretch of the river is a water haven for goldeneyes, redheads, canvasbacks, ruddy ducks, and green-winged teal.

Other birds commonly seen in the Snake River Sector include the white pelican, dowitcher, American avocet, California gull, ring-billed gull, marbled godwit and ring-necked pheasant. Various species of hawks and owls are common. Mammals found on the islands include muskrats, beavers, otters, raccoons, mule deer, blacktail rabbits and cottontails.

15.5 Turn onto the dirt road to the right which leads to the Map Rocks, blocks of lava with Indian symbols of unknown origin and meaning. About 50 feet east of the road, the first one is 9 miles from this point and the second is a mile further on. Sign points to "HISTORICAL ROCK"'.

17.1 Lake terraces are visible across the river against the hills. Vegetation along the river is mostly willows with greasewood along the road.

18.5 The flat topped bank across the river is the old flood plain of the Snake River; the alternating bands of coarse water-rounded gravel and sandy silt indicate this was laid down by river action instead of a lake which would not have enough current to carry rock. This mass of rock and soil was brought down from the Owyhee and Boise Mountains during a period of heavy erosion and laid down by the Snake as it swung in broad curves back and forth across its old flood plain. Now that the debris coming down from the mountains is not so heavy, the Snake is, in places, cutting down through the old flood plains exposing the alternating layers of rock and silt deposited by its former meanderings across the valley. Present grade of the river is about 2 feet to the mile. It is now eroding its channel – as can be seen by its distinct banks in many places – and is not at this time laying down flood plains.

20.1 The old barn with a cupola across the river is the site of the old Bernard Ferry and stage station. The community was known as Central. About half a mile down river from here the old road comes down over the rim from the east. It forked at the top, one branch leading to Nampa and the other going towards Boise. From Bernard's Ferry it went up Reynolds Creek, past Reynolds, Share and Democrat to Dewey and Silver City.

22.6 The greenhouses across the river are where Sola Ripe tomatoes are grown. They are heated by hot springs. The old post office of Enterprise was once located in this vicinity on the south side of the river. Access was by Warm Springs Ferry.

The large building near the river houses the Givens Springs swimming pool. Mr. and Mrs. Milford R. Givens located here in 1881 and built a hotel and pool which became quite popular as a resort with the Silver City miners as well as residents of Boise Valley. The hotel burned in 1938 and was not rebuilt. The present building over the pool was built in 1947. The spring itself is about 145°F and contains iron, magnesium, sulphur and other minerals in small quantities.

Several of the homes along the river are heated with water from hot water wells.

22.6 Historical rock to the right of the road up the hill about 25 yards. Although some have tried to interpret the writings as being directions, there is no general agreement on the meaning of the symbols. This is probably a "dream rock" on which Indians recorded their dreams believing this would make them come true. Such rocks were considered sacred by the Piutes which roamed along the river 900 years ago.

24.5 Second rock with Indian writing, right next to the road on the right. This is known as the "Map Rock" because of the long winding line going across the rock which supposedly represents the Snake River from Wyoming to the Columbia. However, this is mere supposition. Other carvings picture deer and other game.
Lizards and other reptiles, including rattlesnakes, are abundant here.

24.8 Old Givens Grade to the right.

Note color and variety of lichens on the boulders.

29.0 Note the tilted layers in the lake sediments across the river.

29.7 The buildings of the Job Corps are across the river.

30.3 At the old Riverside Church, turn left, then right, (after about .2 mile), passing through the community of Knowlton Heights.

34.0 Turn left at the stop sign (just past the school house) onto the Marsing Road.

34.6 Note old sheep fence and lambing yard.

35.0 Pickle Butte (60 feet high) to the east – an upwelling of basalt. The road turns north.

35.2 Junction with Highway 72. Continue north.

35.9 Lizard Butte to the east (right). This is an erosion remnant of a volcanic vent now filled with water-rounded crystalline pebbles incorporated in volcanic agglomerate, lava, cinders and baked silt of the Idaho formation.

Note old lake beds in highway cut to the right, and slightly green ash beds in the distance to the left.

This area of orchards is known as Sunny Slope.

39.3 Road makes a right turn at top of the hill. This highway (known locally as Karcher Road) continues straight east for 10 miles to the junction with U.S. 30 at the edge of Nampa, and then on another 3 miles to the junction with Highway 45 in the center of Nampa and one mile southwest back to the starting point.

OWYHEE COUNTY

INTRODUCTION

Owyhee County is the second largest county in the state. It includes sagebrush hills and heavily forested mountains (elevation ranges from 2,000 to 8,300 feet deep) flat desert land and canyons, the largest river in Idaho (Snake River), smaller rivers, mountain creeks and small hot springs. Rocks and minerals found in the county range from opal, agate, and jasper to precious gold and silver. Fossils and petrified wood are found in many different locations. There is evidence of Indians from 10,000 years ago to recent time.

ROADS

U.S. 95 goes through the northwestern edge for a few miles between Marsing and the Idaho-Oregon border; State Highway 45 follows along south of the Snake River from Walters Ferry to Bruneau, and State Highway 51 goes south from Bruneau through Grasmere and Duck Valley Indian Reservation (Shoshone-Piute) to Nevada. These are the only highways. Except for the region around Homedale and Marsing, roads are few and far between – there are hundreds of square miles with no roads.

There are irrigated farms around Homedale and Marsing, along the Snake River and creeks, but most of the county consists of mountainous country and rangeland owned by the BLM and used for sheep and cattle range. Wild horses once roamed this area, but few are still around.

The Owyhee Historical Society maintains the County Historical Museum in Murphy (population 50), the county seat, and is active in preserving and marking historical sites. Meetings are held on the third Fridays of February, April, June, August, October, and December in the Courthouse in Murphy. Visitors are welcome. Information about the society and its activities may be obtained by writing Mrs. Doug Hyslop, Route No. 4, Nampa, Idaho 83651.

BRUNEAU SAND DUNES

MAPS: **Sand Dunes – Indian Cove 15'**
Canyon-Bruneau 15'
Winter Camp 15'
Bathtub – Indian Cove 15'

LOCATION

Now being developed as a state park, the Bruneau sand dunes are said to be the highest in North America – over 420 feet high. To reach from Mountain Home, take the Bruneau-Mountain Home highway (Highway 51) south for 15 miles; cross the Snake River and turn east at the sign indicating Sand Dunes; go 4 miles, then turn south at the next sign and go 2 miles to the dunes. Or from Bruneau go north 5.5 miles on Highway 51 to the turnoff (see map, Figure 15).

ORIGIN

The large dunes occupy several square miles and now appear to be stabilized. Smaller traveling dunes are being blown to join the massive main dune. The prevailing winds are from the south-southwest with a westerly cross wind, and have blown the sand from lake-deposited sandstone to the west.

The pale gray dunes are all the more surprising as they sit in a cove surrounded by dry basalt-capped mesas and irrigated farms. The cove may once have been the channel of the Snake River, for topographically it has the shape of a cutoff meander.

LAKES

The present ponds, however, are not part of the river, for they formed only recently-appearing in 1953 following construction of the C. J. Strike Dam on the Snake west of Bruneau. It was originally thought that the lakes were due to seepage from the reservoir, but since their water level is over 24 feet higher than the backwater, it is not believed that the lakes are fed by underground springs. In any case, they are gradually increasing in size, with the deepest one being 40 feet.

On the backside of the large dune an old farm has been buried. It is interesting to note that the presence of this and surrounding farms has destroyed the desert cover and has allowed more sand to be added to the dunes. In a sense, the farmer buried his home by tilling his soil.

This area offers unique opportunities for scientific study for biologists and geologists and many problems are suggested.

GEOLOGY

A typical crescent-shaped dune known as a barchan is visible at the north edge of the park. Under what conditions do dunes form in this particular shape? Look at the large dune by the entrace road. Which is the windward side? Are all the slopes the same angle (steepness)? Will the dune continue to get higher or is it decreasing in size? How might the answer be found?

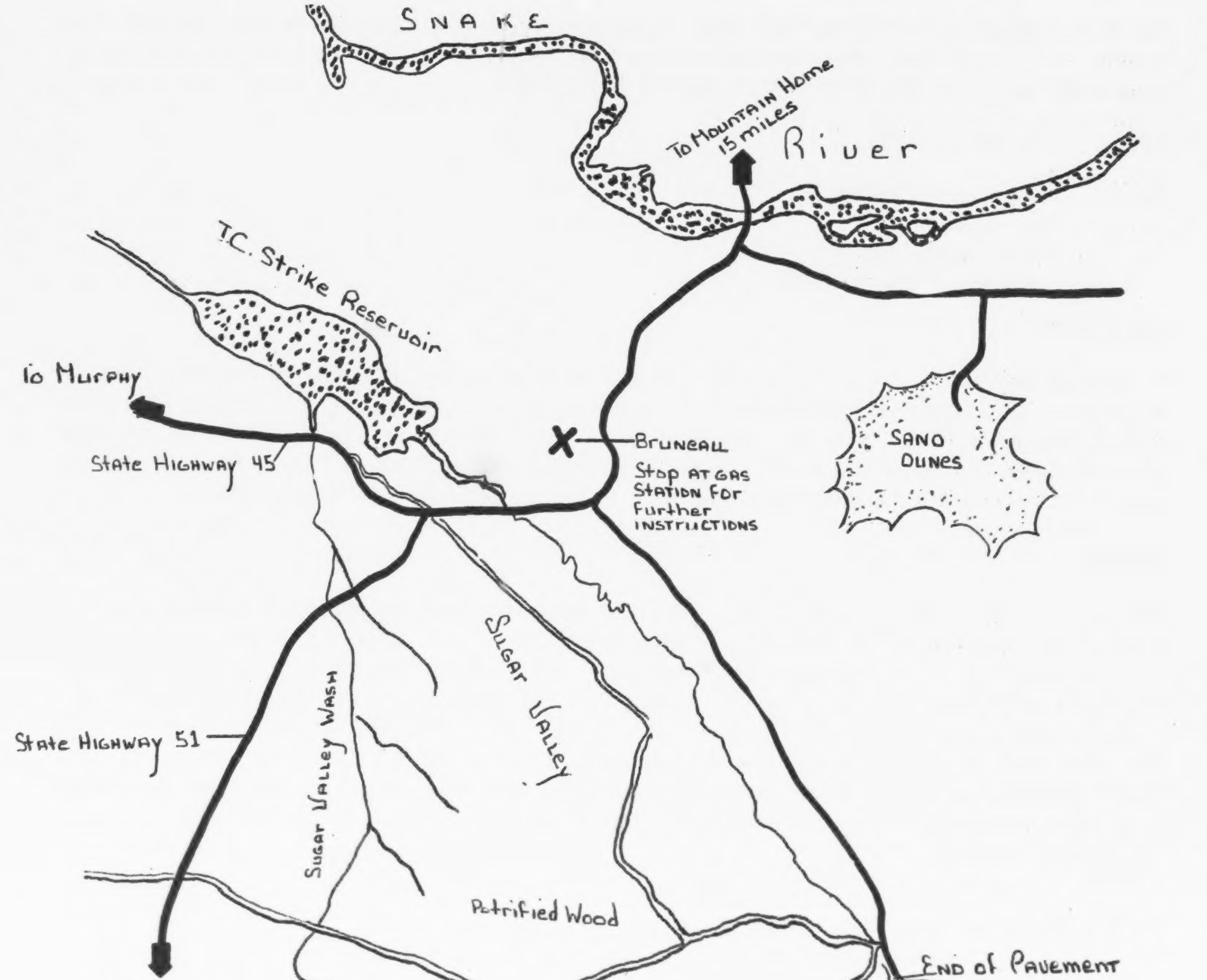

SNAKE River
To Mountain Home 15 miles
T.C. Strike Reservoir
To Murphy
State Highway 45
Bruneau
Stop at gas station for further instructions
Sand Dunes
Sugar Valley
Sugar Valley Wash
State Highway 51
Petrified Wood
To Grasmere
End of Pavement
Fossils xxx
Indian Bathtub
Bruneau River
Bruneau Canyon
Overlook
Key
Paved Roads
Dirt Roads
Rivers
0 1 2 miles

FIGURE 15

Has man had any effect on the size or shape of the dunes? Note the wind-polished stones – the variety of size and color. What was the probable source of these rocks? Notice how even pieces of glass have been etched and frosted. Incidentally, particles of this sand flouresce with a greenish color under ultra-violet light.

VEGETATION

Where is the vegetation the thickest? How did it get here? What are the sources of seeds? (Hint: the Idaho Fish and Game Department planted the trees by the lake but probably the wind, birds, and other agents are responsible for other plants.) What differences might be seen here in 20 years? In 100 years?

Notice the difference between the kind and amount of vegetation near and in the water, and on the dunes (in and along the lake are bullrushes, sedges, and Russian olives; nearby are various grasses and low shrubs.) What adaptations enable the plants to live in the sand? What kind of roots do they have? Are their leaves any different from plants in other areas? Note how the vegetation, even the smaller plants, anchors the sand. As a matter of aesthetics, note the patterns the tips of the grass trace in the sand as the wind blows them – most are semicircles, but some seem to trace almost a complete circle. These make beautiful black and white photographs.

This water is quite alkaline. What visible evidence is there of this (foam, alkali deposits, plants that live only in saline soil)?

Note how and where the tamarisk (salt cedar) grows. What adaptations does it have that make this possible? These seem to be increasing in numbers. What effects will this have on the area?

Note the miniature forms of plants – lupines, phlox and others that grow close to the ground. Abundant wildflowers bloom in May and June including sand lilies, evening primrose, arrowleaf balsamroot and many others.

ANIMALS

At first glance, the dunes may appear barren of life, but careful observation will reveal an abundance of animals. Note the camouflage exhibited by the sand-colored grasshoppers (another miniature species) and the horned toads. What evidences of animals can be seen? Note the especially heavy tracks around some holes – almost like Grand Central Station! As soon as the sun goes down, beetles (over 100 different species have been observed here), kangaroo rats, lizards and possibly snakes become active.

In the lake are blue gill, bass, and crappie planted by the Idaho Fish and Game Department; frogs are found near the shore. A small parasite which causes a skin rash known locally as "swimmers itch" also has been "collected" from the lake water, and although the water has been treated chemically, it would be wise to check with park officials before swimming.

BIRDS

The following have all been seen in the sand dunes area, and while this is not a complete list, it does illustrate the variety of birds which can be observed here: western horned lark, sparrow hawk, avocet, Wilson's phalerope, ringbill gull, yellow headed blackbird, blacknecked stilt, great blue heron, killdeer, and burrowing owl.

Since this area has such valuable potential for both recreation and study it is important that each visitor practice consideration for others. The motto of the cavers is a good one – "Take nothing but pictures, leave nothing but footprints." This does not apply to fish which were originally put here for fishermen, but plants and animals should be observed, examined, and then left for others to enjoy. Litter has in the past been a major problem; don't add to it! In fact, if each one would take responsibility for his own and for cleaning up any that he sees, it would cease to be a problem. Groups of students on field trips especially should include area cleanup as a part of their activities as a good example to the less careful adults.

BRUNEAU CANYON

Return to Highway 51 and go south to the town of Bruneau; at the Intersection is a sign pointing east to Bruneau Canyon (about 20 miles). To reach the lookout point, go 8.1 miles to the end of the pavement, then continue another 8.5 miles on the dirt road. Turn right at the small sign and go about 3 miles (See map, Figure 00).

The road at first goes through fertile Bruneau Valley (which has an interesting history of Indians and settlers) and then through hills formed of the Payette Formation (lake-deposited silt and sand). About 9 miles east of Bruneau is the throat of an old volcano about ¾ mile north of the road. It is composed of cinders, pumice and scoria. Other kinds of pyroclastic (volcanic) materials may also be found on its surface. It is a steep climb to the top but well worth the experience of examining a volcano firsthand.

SAYLOR CREEK RANGE

Continuing on, the road now crosses a plateau which is part of the Saylor Creek Experimental Range which covers 4,200 acres. A cooperative effort of the BLM and the U.S. Forest Service, its purpose is to improve range management by finding out which grasses provide highest cattle gains while also holding the soil, what the capacity of various grasses is and what grazing intensities are best. Parts of the range have been sprayed with chemicals to kill the cheat grass, and sagebrush has been thoroughly chopped up in some areas. Crested wheat grass has been planted on both sides of the road leading to the Bruneau Canyon Viewpoint. In contrast to cheatgrass, an annual with a small root system that dries out early in the spring, wheatgrass is a perennial with a large root system that stays useable through much more of the grazing season, thus providing more food for the range cattle. Note other evidences of man's management practices.

VIEWPOINT

Turn right at the small sign pointing to Bruneau Canyon. At the viewpoint, there is a spectacular view of the Bruneau Canyon, 800 feet deep. Note the many distinct lava flows visible in the canyon walls. The lava is mainly Pliocene basalt, cut by the river about one million years ago. The head of the Bruneau River is in the Jarbidge Mountains of Nevada, and was described by an early writer in this way: "It runs through a tremendous chasm, rather than a valley . . . basaltic rocks rise perpendicular everywhere and the country appears an indescribable chaos." The name reportedly came from French "brun" for dark or gloomy and "eau" for water, from the French-Canadians of Mackenzie's Hudson Bay trapping party which came through here in 1818. While study from the viewpoint is limited to geology, the river bed itself is said to be a fascinating place for observation of plant and animal life.

However, **don't try to go down into the canyon from this point!** The best way to get to the river is either to go in from one of the side draws to the south, or to walk up from the Bruneau Valley, about 6 miles downstream.

On the way back to Bruneau, a side road with several interesting features may be taken by turning left at the Hot Springs sign and crossing the Bruneau River. The tiny plunge near the road is not open at present. Turn left just past the first farm (See map, Figure 15).

A few miles along this road on a hill to the west is a ridge of marine fossils. Diggings are visible from the road. Gastropods, clams, "drumfish" teeth and vertebrae have been found here. The shells are not well preserved – quite brittle – but they give undisputable evidence that this area was once under water. There are many other fossil deposits in Owyhee County but remember that some are on private land and that even on public land the overburden should never be removed to cause or increase erosion!

One-half mile down the road, just before it descends to the Indian Bathtub, the road passes by limestone "vases" in the road and to the east. An attempt was made to quarry this deposit at one time but was not successful. How and by what might the limestone have been deposited? Is its location near hot springs coincidental or could there be a connection?

INDIAN BATHTUB

Start downhill and keep to the left to reach the Indian Bathtub, where water from a hot spring forms a waterfall and drops into a pool whose temperature is perfect for swimming any time of the year. Look for the source of the hot water. Note sharp changes in environment above and below the water source. Is there evidence of flash floods and/or spring runoff?

Indian writings are visible on rocks forming the side of the pool. Orchids used to grow on the side of the canyon through which the hot water flows to join the Bruneau River but these have all been destroyed by vandals. Beware of poison ivy, which is abundant here. Also, rattlesnakes are found here as in most of Owyhee County. The part of the Bruneau Canyon viewed earlier can be reached by a 6-mile hike from this point.

About 5 miles to the west, near Sugar Valley, is the area known as the Driftwood Region where pieces of petrified wood 4-6 inches long may be found lying on the surface. Fish remains and mammal bones may also be found there but not generally along the road – the top of the ridges and the draws are the best hunting areas.

WALTER'S FERRY – REYNOLDS CREEK

MAPS: **Walters Butte 7.5'**
Wilson Peak 7.5'
Silver City 15'

0.0 Begin mileage 17 miles south of Nampa on State Highway 45 at the Walters Ferry Bridge on the Snake River. This bridge is located on almost the exact site of the old ferry crossing. A ferry boat was in continuous service at this same location for over fifty-seven years – from

1863 until the present bridge was completed in 1921. Besides the ferry boat, there were also at various times a hotel and a dining hall, blacksmith shop, saloon, barns and corrals, toll-house, loading chutes (on both sides of the river), and graneries. There is a great deal of history connected with this site as well as with other ferry sites along the river for it was a vital part of the Boise-Silver City stage route. Indian attacks occasionally occurred in this vicinity. The old rock-walled hotel and dining hall are still standing. The property is presently owned by Dr. and Mrs. S. A. Swayne, both of whom are endeavoring to preserve the historic property. At present there is a grocery store and service station here and across the road is a shady picnic area. (See photograph, figure 16.)

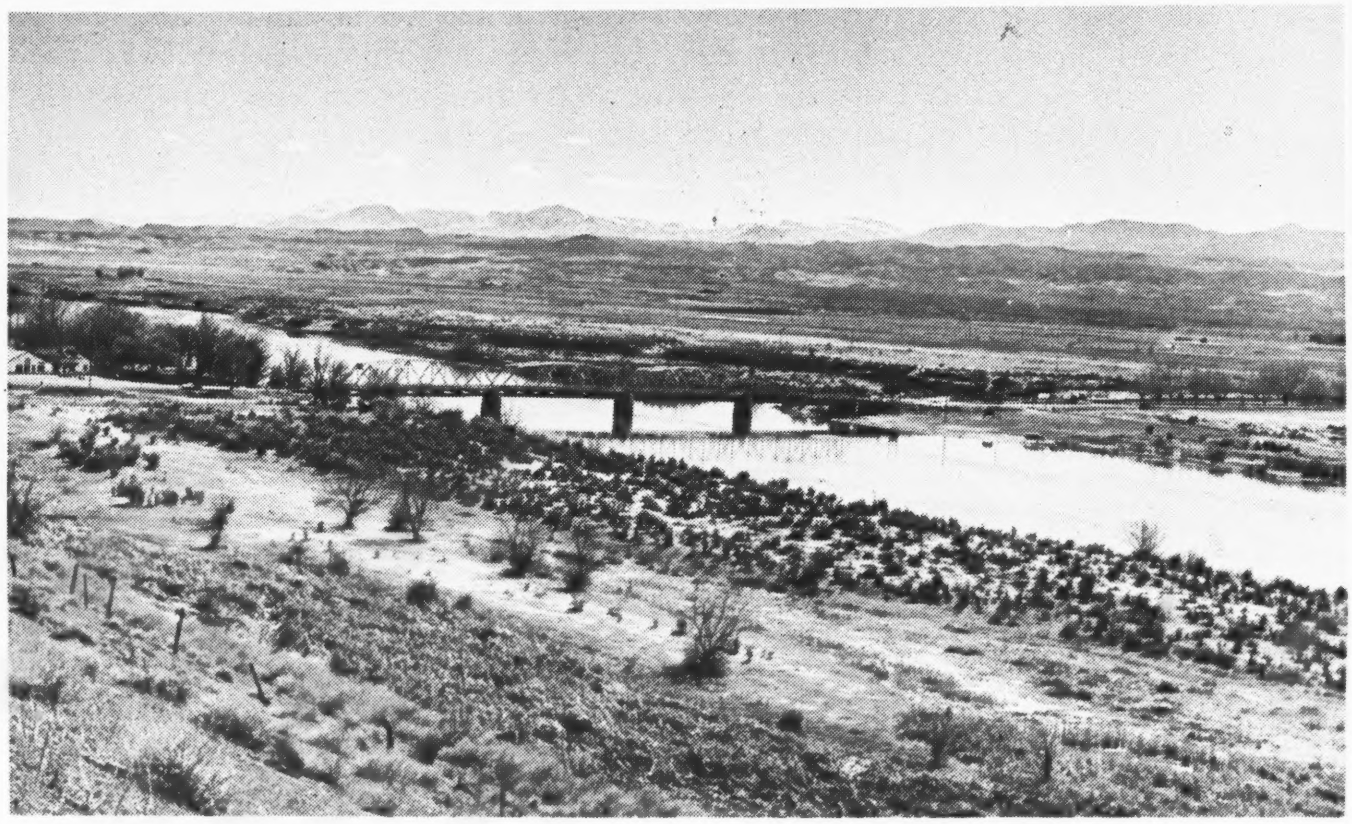


FIGURE 16

About 0.2 mile up the highway above Walters Ferry is a unique geological feature. Note the results of differential weathering in the large pit to the east of the highway. The pinnacles are formed of black sand, a mixture of small cinders and river gravel and are capped by a more resistant substance. This was probably an eddy bar resulting from the catastrophic flood which originated from ancient Lake Bonneville in northern Utah. The lake overflowed and discharged through Red Rock Pass near the Idaho-Utah border, and entered the Snake River Canyon via Marsh Creek and the Portneuf River. The flood had a peak discharge of approximately 15 million cfs (cubic feet per second), and a possible continuous discharge for almost one year. Discontinuous outcrops of gravel deposited by the flood exist as far down the Snake River as Homedale and are derived almost entirely from local basalts.

Cross the bridge. Note tamarisks (salt cedar) growing here – evidence of alkali soil.

0.4 At junction keep left, continuing on Highway 45 toward Murphy.

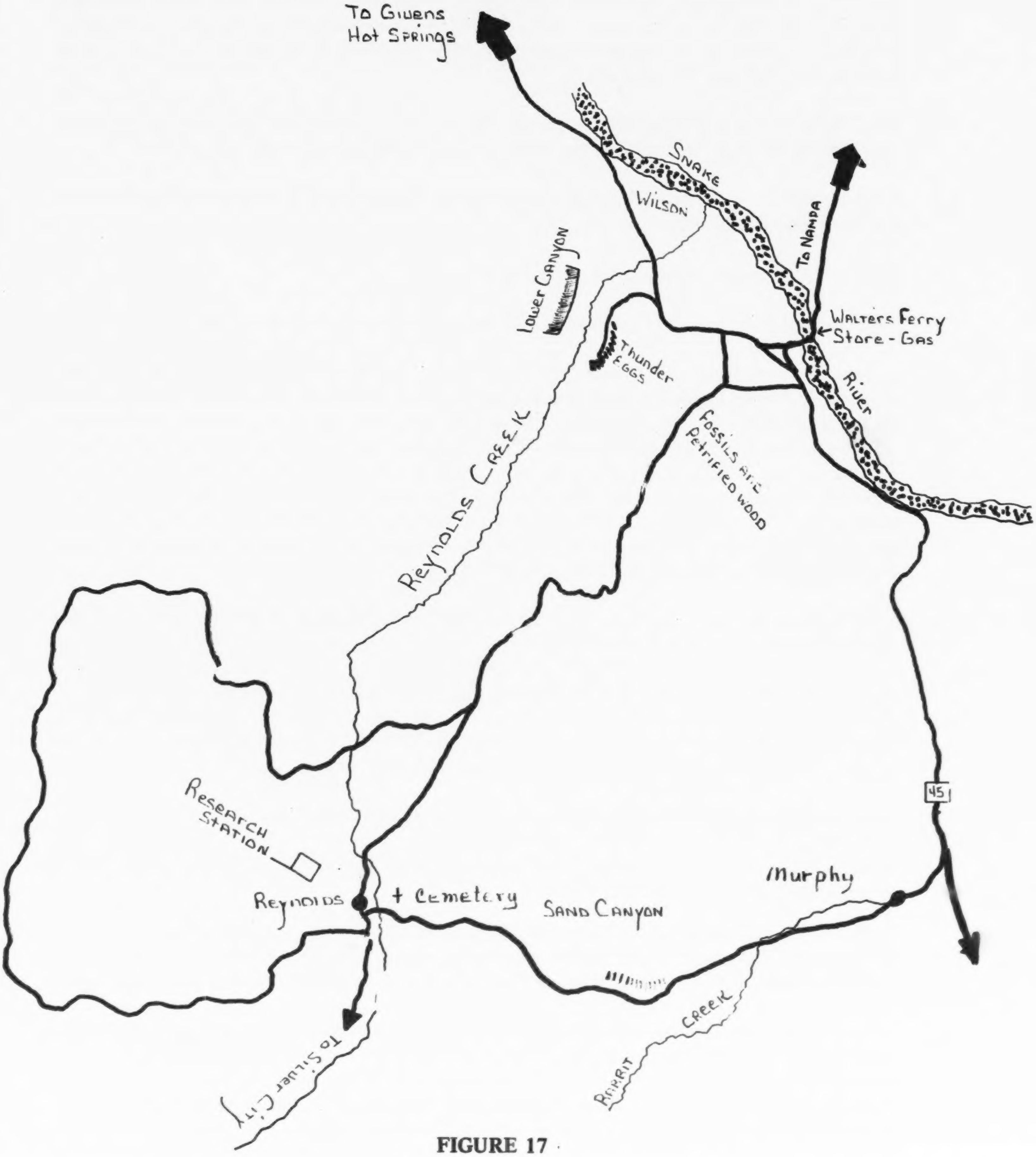

To Givens Hot Springs
Snake
River
Wilson
To Nampa
Lower Canyon
Walters Ferry Store - Gas
Thunder Eggs
Fossils and Petrified Wood
Reynolds Creek
Research Station
Reynolds
+ Cemetery
Sand Canyon
Murphy
45
Rabbit Creek
To Silver City
0
1
2
3
4
miles
Scale

FIGURE 17

Reynolds Creek

Notice the Melon Gravels, "petrified watermelons", deposited by Pleistocene Lake Bonneville Flood. In the distance to the south can be seen the fault-line scarp at the front of the Owyhee Mountains, which are composed of lower Pliocene welded tuff, overlapped by fine grained basin deposits of early Pliocene age.

1.5 Turn right onto paved road (at the poodle sign). This is the road to Reynolds and goes due west. Watch for long-eared owls in the grove of locust trees near the road.

2.8 Road bears left. Along here the road is crossing the Glenns Ferry Formation of Late Pliocene and Early Pleistocene age.

3.4 Road to right leads to viewpoint overlooking the valley.

4.0 Road to right leads to an old cabin and creek bed with agate and rhyolite nodules.

4.2 Approximate contact of Lower Pliocene Poison Creek Formation and Glenns Ferry Formation. Poison Creek Formation is the light-colored sediments exposed on hillsides to the south. It consists of beds of massive volcanic ash, silt, sand containing granitic cobblestones and conglomerate. It consists primarily of lake deposits, and fossil mammals and leaves found in it have been dated as Early Pliocene. The Glenns Ferry Formation also consists of lake and stream deposits, primarily clay, silt and very fine sand. Younger than the Poison Creek Formation, it is dated as Late Pliocene or Early Pleistocene on the basis of study of the numerous vertebrate, invertebrate and floral fossils found in it. These formations both erode into chalk-white knobs and bluffs of gray-white ledges.

4.4 Road crosses pediment surface. Rhyolitic welded tuff on right. Remnants of welded tuff overlie Poison Creek Formation on the left.

5.9 Bluff of Poison Creek Formation on the left. Rhyolite on right. Geodes and thunder eggs are abundant here embedded in the tuff on the right (west) side of the road. Across the road (east) there are pieces of petrified wood and fish fossils up on the high ridge. Hike about .2 or .3 mile to reach this but watch all the way for pieces that may have washed down.

6.1 Lower glassy zone of rhyolitic welded tuff overlying Poison Creek Formation.

6.2 Road is on granite – probably a part of a stock of the Idaho Batholith – the lowest appearance of granite in southern Idaho.

Some of the animals and birds that might be seen in this area are magpies, crows, ravens, and horned owls; jackrabbits, cottontails, coyotes, kangaroo rats, desert wood rats, and ground squirrels; western fence lizards, collared lizards, bull snakes, whiptail snakes and rattlesnakes.

7.9 Ash, tuff and boulders associated with first stages of extrusion of rhyolite very prominent along left side of road along curve.

10.0 Drainage divide of Reynolds Creek Watershed, a 93-square mile valley being studied by the U.S. Department of Agriculture to furnish basic water supply information for western rangeland. Set up in 1960, its purpose is to determine what happens to water that falls as rain or snow in this watershed – how much finds its way to a stream, how much seeps underground, how much evaporates and how much is used by vegetation. To find the answers, engineers and scientists at the station have set up a system of recording rain gauges all over the watershed to determine how much water falls from the sky, and a system of flow-measuring devices in the stream to find how much water runs out of the valley. More information on the project can be obtained by contacting the Northwest Hydrology Research Watershed Office, 306 N. 5th, Boise, ph. 342-2711 (or phone the station at Melba 495-2542).

Since the elevation ranges from 3,500 feet to 7,000 feet with a corresponding change in precipitation from 5 to 30 inches annually, the vegetation also varies. It is principally sagebrush and related species and grasses in the lower elevations, with junipers, aspen, ponderosa pine and fir on the higher slopes.

Prominent bluff of the right is southernmost extension of rhyolite. To the left and straight ahead is Upper Miocene Hoot Nanny Basalt capping granite. Hoot Nanny Basalt forms base of Reynolds Basin group and covers 35% of Reynolds Watershed.

10.9 Note the USDA station's devices to the left. Ground water level is monitored in a well and a rain recording gauge measures precipitation. Difficulties have been encountered in protecting these from livestock and people.

It is interesting to note that most wells in lake sediment in this area have iron bacteria which makes the water putrid; however, wells in meander sediments and basalt are usually good.

11.5 Road passes over Hoot Nanny Basalt onto Arkosic Lake sediments which are similar to sandstone but contain more feldspar. These form the top of Reynolds Basin Group.

11.9 BLM spring on the right – water seeping from Arkosic sand unit. Note Soldier Cap, elevation 5,430 feet, small butte visible to the northwest. Composed of highly resistant olivine basalt resting on granitic rock, Soldier Cap is probably the eroded and deformed remnant of a cone surrounding a single vent or cluster of closely spaced vents.

12.7 Leave road – turn right to Reynolds Creek Canyon. Leave Arkosic unit, enter canyon of granite. Note: this road may not be passable for cars or busses. **Check!** Note basalt on horizon at upper left. This unit, the Soldier Cap Basalt, interfingers with Hoot Nanny. This outcrop is on the upthrown side of a fault with at least 800 feet displacement. Note weathered granite – this is an excellent example of exfoliation.

13.7 Main weir at outlet of Upper Reynolds Creek drainage. Maximum capacity of 20,000 cubic feet per second. Return to main road to start odometer reading.

14.7 Main road.

14.9 Hoot Nanny Ranch – turn left.

15.2 Road to right goes up Salmon Creek. The ridge to the west is composed of glassy volcanic material. If you followed the Salmon Creek Road you would cross basalt, sandstone, latite (a light colored volcanic rock between basalt and rhyolite that shows exfoliation similar to shale), volcanic tuff and an outcropping of granite. There is a coal mine off this road. This road is passable only by pickups or 4-wheel drive vehicles.

Keep on main road and continue south.

17.8 Reynolds Creek Watershed Research Station. Stop here for more information about the project.

Across the road is the Reynolds Cemetery which contains graves dating from the 1860's. A great deal of background information can be learned from the old grave markers. This cemetery is well cared for and is still used.

From here there are several choices. A jeep or 4-wheel drive vehicle can go south to Silver City or west over the ridge. The best road is the one that goes east to Murphy, the county seat (about 12 miles). This road is open year around except when flash floods cause temporary closing due to washouts, and many interesting geologic features can be seen along this route, which follows Sand Canyon and then Rabbit Creek. This information is based on USDA Northwest Hydrology Research Station trip, summer, 1967.

FUNGI OF OWYHEE COUNTY

Mushroom and other fungi are generally associated with dark, moist habitats such as thick forests; however, under proper conditions of precipitation, humidity and temperature, deserts such as those found in Owyhee County can also be rewarding hunting grounds for fungi.

In the following section, Ellen Trueblood describes what, where, and how fungi may be found in the Owyhee Desert, drawing from the experience she and her sportsman writer husband, Ted, have had during the past ten years.

As with many sections of the book, this is included as a model or sample of what might be developed in any section of the state. If mushrooms can be found in the most arid part of the state, surely they can be found in any other part, at least sometime during the year.

Descriptions complete enough to make identification are not included here but reference to the books listed in the Bibliography and careful observation should enable even the beginner – teacher or student – to make a start toward becoming a mycologist. The purpose of this section is educational, not gastronomical, and no advice relative to edibility is intended.

DESERT MUSHROOMS

By Ellen Trueblood, Nampa, Idaho

In planning a desert mushroom hunting field trip, the first consideration must be weather. Growth of fungi is dependent upon precipitation, humidity and temperature in addition to suitable habitat.

The surest way to be disappointed with a desert mushroom hunt is to set a date regardless of weather. A long dry spell with hot weather and wind will offer nothing but a few puffballs that remain for weeks or months after fruiting.

The best fall for mushroom collecting in southwestern Idaho in many years was that of 1962 when intermittent rains continued from September through early December, when it became much colder and the temperature fell below 28 degrees. There were few periods of wind and humidity continued high.

During this period one could find gilled mushrooms and puffballs such as are seldom seen on our Owyhee desert. Even slender *Mycena* grew on willow leaves and roots at the mouth of Poison Creek canyon south of Homedale. *Tricholoma*, a much larger gilled mushroom, grew near the

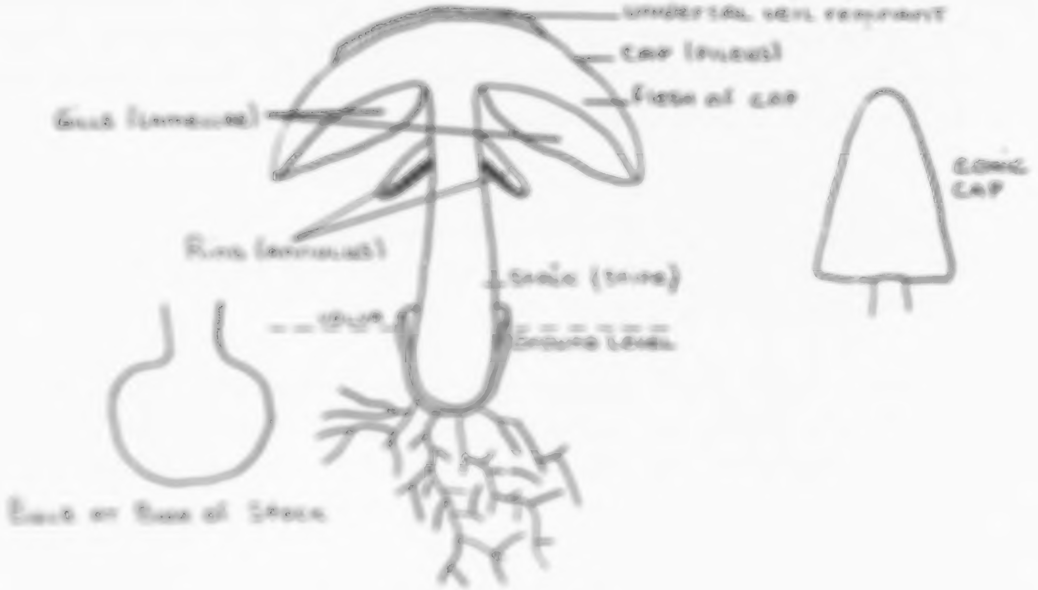


FIGURE 18
Typical Mushroom

Bureau of Land Management watering trough near Poison Creek and beneath the wild rose bushes near the mouth of the canyon. It was also found beneath sagebrush and along other desert creeks in Owyhee county.

Don't take a field trip immediately following a good rain; it is better to wait a week or two for the fungi to develop from the strands of mycelium that have lain dormant awaiting moisture, suitable temperature and humidity. If possible, scan the area before taking students.

Youngsters in primary grades sometimes are more successful than adults for their shorter stature gives them a closer look beneath brush and in other habitat where fungi may be expected.

Beginners in the study of fungi find it interesting to make spore prints of agarics (gilled mushrooms). Also one needs to know the color of the spores to classify agarics. Cut off the stipe, or stem, and place the pileus, or cap, of the mushroom on a white piece of paper. Cover it with a bowl and leave it an hour or so and it will leave a spore print on the paper. Sometimes it is advisable to put newspapers or blotters beneath the white paper if the specimen is quite moist.

Puffballs have their spores enclosed in their peridium, or pouch, and are known as gasteromycetes (stomach fungi). Their spores also vary in color. Some puffballs are simple in structure and more or less globular in shape. Others have a true stipe or other adaptations.

In October, November and sometimes December one can find *Agaricus campestris*, the common meadow mushroom, beneath sagebrush near desert streams. In the fall of 1962, it fruited beneath the fallen leaves of desert shrubs, principally sagebrush and bitterbrush, on flats and on gently sloping hills. Sometimes this delicious mushroom can be found in late April, May and June. A good place to look is where sheep have bedded down for several nights, or around lambing sheds or fence rows where stock has wintered. Stockyards, barn lots and spring rains and 40 to 50 degree temperatures can bring rewarding results. However, as temperatures increase in the spring, infestation by insects also increases. The earliest meadow mushrooms have been found in the spring was late March and they were completely free of larvae.

Among other gilled mushrooms one may expect to find at the base of the Owyhee mountains is *Pleurotus*, the oyster mushroom, which grows on willow or cottonwood, poplar and other deciduous trees. Appearing quite similar but too tough to eat is *Panus* which grows on desert cottonwood trees. The oyster mushroom prefers cool, rainy weather but not hard freezing temperatures.

In moist weather or following it, *Agrocybe* and *Leucoagaricus* grow in decaying sagebrush. Debris from an old fire land or where brush has been cleared from land and partly covered with dirt is a good place to hunt. These occur in late June or early July.

Smaller gilled mushrooms of the desert include *Melanoleuca*, *Naucoria*, *Psilocybe*, *Rhodophyllus*, and *Clitocybe*. One species of *Psilocybe* indigenous to the north temperate zone is *P. coprophila* found on cow dung. It appears after fall rains and fruits until winter frosts. Another *Psilocybe* is a very tiny one with a pointed cap. It grows among the moss in desert canyons in January and February.

A tall mushroom with a bell-shaped pileus that grows on cow or horse manure is likely to be *Panaeolous semiovatus*. A ring or annulus will be found on its stipe. It can be found spring, summer or fall in meadows. The color of the pileus may vary from light leather to yellowish to gray.

Probably the most common group of fungi found on the desert is the puffball. The fruiting body of the *gasteromycete* (puffball) offers greater protection through periods of extreme heat and cold than other types.

Puffballs found in Owyhee county include *Calvatia*, *Lycoperdon*, *Bovista*, *Disciseda*, *Mycenastrum*, *Geastrum* *Astraeus*, *Tulostoma*, *Battarraea*, *Secotium*, *Chlamydopus*, *Montagnea*, *Cyathus* and *Crucibulum*.

Cyathus and *Crucibulum* are members of the *Nidulariaceae* or Bird's Nest Mushrooms. Fruiting bodies of this family resemble a small nest with eggs in it. On the desert, January, February or March are the best times to look for them if there has been good precipitation in late fall and winter. They grow mostly on the fallen twigs of desert shrubs that lie beneath the shrubs on moss, or occasionally on larger limbs of dead brush. To find them, first look for the green moss that has been revived by moisture. Then look for these tiny nests on the twigs. Look carefully, the nests of some are only 2 to 3 mm in diameter! They have been found on the desert in the fall and late spring when precipitation was heavy, but this is not generally the case.

Montagnea is a real puzzler for the novice collector. One notices black leaves or gills around a disc (usually dried and standing like a skeleton) on a rugged, fibrous stem. Dig down and find the base of the stem and you will discover a volva or cup. At first the entire plant was enclosed in a sac or pouch of which the volva was part. As the plant matured the stem elongated carrying the gill-like plates and disc above the ground. The universal covering of its early development places it in the gasteromycetes.

Tulostoma is a common desert mushroom that looks like a puffball on a stem. It occurs both with and without a volva depending upon the species. It has been found ranging in height from 15 mm to 11 cm. It is found most often in shady soil along creek beds or dry washes but can also be found on flats in open areas.

Secotium, a puffball with a stripe-columella running through its center and with gill-like plates is often found along creek beds or dry washes. It is important mycologically because it marks an evolutionary stage between puffballs and agarics. The plates are similar to the gills of the agarics and the columella similar to the stem of an agaric.

Astraeus hygrometricus is interesting because of its hygroscopic (water-absorbing) rays. When it rains the rays expand, exposing the spore sac. When dry, hot weather prevails, the rays close over it. This may be demonstrated by placing the specimen on a moistened sponge and covering it with a glass or bowl. After about an hour the rays will open. Put it in the sun and they will soon reclose.

There is only one species of *Astraeus*. It may be found beneath sagebrush or bitterbrush in their leaves and duff (decayed organic matter on the desert floor) in spring, winter or fall, depending on moisture. If you find one, scratch around in the duff for others. There were 187 found under a single sagebrush one January day.

Disciseda is easy to recognize because its disc beneath the spore case is somewhat like an acorn. It is found near desert shrubs, often in sandy soil.

Bovista is found especially where stock has browsed near springs or grassy places.

The most likely place to find the rather rare *Chlamydopus* is in desert shrubs near Coyote Wells, just before the usually dry wash breaks out of the canyon. To reach this, follow State Highway 45 from Walters Ferry Bridge east along Snake River about three miles, south until the highway turns east again, then take a dirt road south into the brush. Follow it to the main fork of the dry creek. Leave your truck or car there and walk in the brush along either side of the wash.

Chlamydopus is found following ample fall rains and before hard freezing weather. It consists of a long stipe bearing a spore sac on its apex (tip). The stipe is larger at the apex and tapers to the base which is enclosed in a volva. It grows in sandy soil.

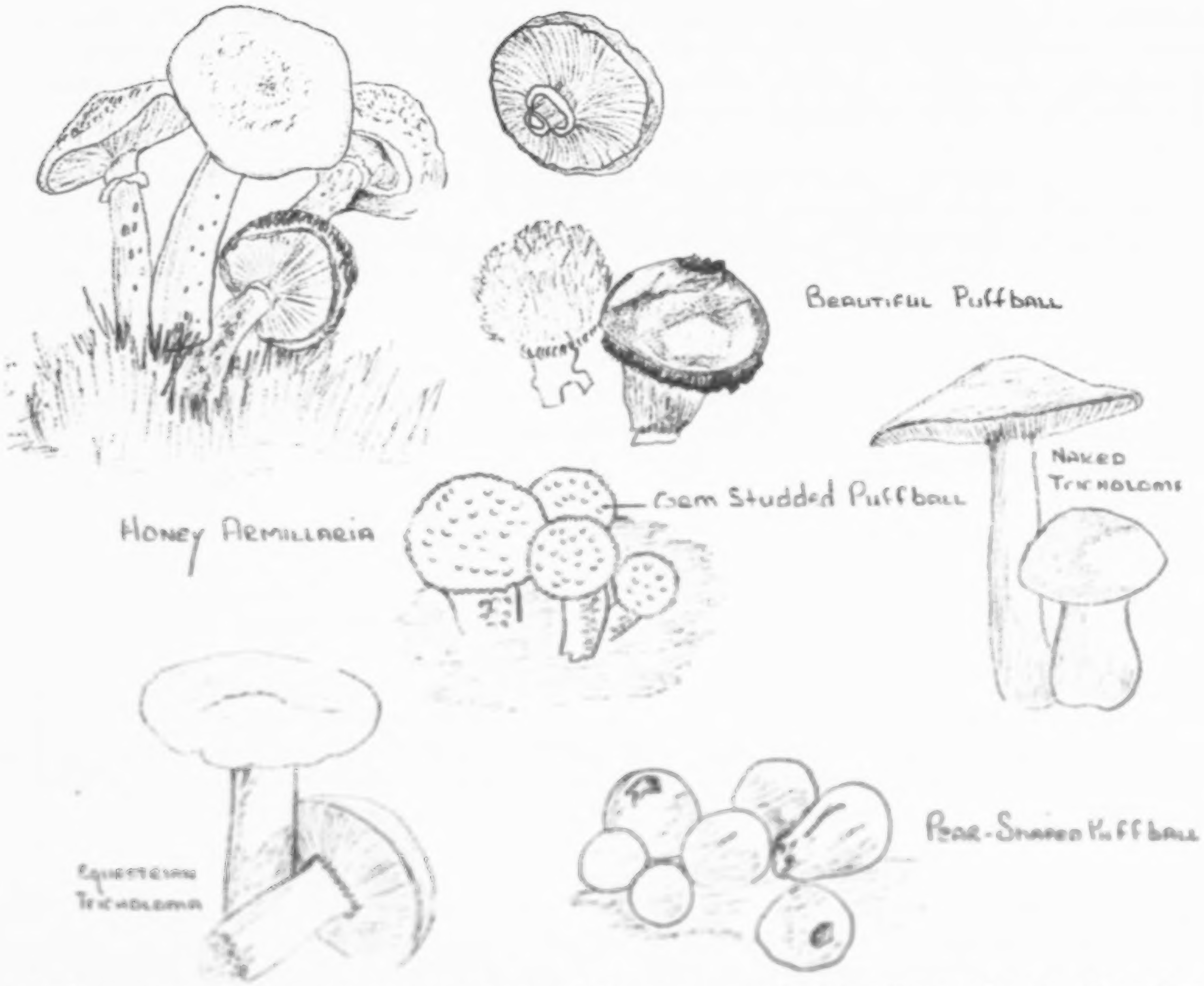
Chlamydopus and *Montagnea* are seldom mentioned in current literature because they are assumed to be rather rare, however they are found on the Owyhee desert.

Occurring at higher elevations in Owyhee County are two puffballs of special interest to collectors of southwestern Idaho. One, *Calvatia booniana*, Smith, is a large gasteromycete named in honor of the late Dr. William Judson Boone, founder of the College of Idaho. It has been found in the South Mountain and Indian Meadows sections of Owyhee county and also in Boise County late in June.

The other is *Calvatia Owyheensis*, Smith, found in the Indian Meadows region and upper Reynolds Creek in mid to late June. Dr. Alexander H. Smith of the University of Michigan named both species, the latter, of course, for the county in which it was first collected.

A basket that can be carried on an arm is useful when collecting. Each collection should be separately wrapped in waxed paper to keep it fresh, and placed carefully in the basket with the heavier ones on the bottom. Fragile specimens should be refrigerated until notes can be made.

Each should be numbered and notes made on when and where collected, by whom, whether it was growing singly, in large numbers, scattered, habitat, etc. Then odor, taste, color, spore color, whether gilled or otherwise and anything distinctive reported. Notes are kept in a numerical file.


Beautiful Puffball
Naked Tricholoma
Gem Studded Puffball
Honey Armillaria
Pear-Shaped Puffball
Equestrian Tricholoma

Mushrooms are dried over a screen such as a window screen preferably using an electric plate rather than pressed like plants. Each collection should be placed on the drier with its serial number so as not to be confused with another. After they are dried, they are placed in boxes with their number, name of collector, date and state. Add a few crystals of paradichlorobenzene to each to prevent insect infestation. These must be added each spring and fall to prevent destruction by beetles and other insects.

Desert puffballs are among the easiest of fungi to preserve because many are completely or partially dried when found. A little while on the drier will tend to kill insect larvae or eggs.

Literature the beginner in fungi will find helpful include the following:

Groves, J. Walton. 1958. Mushroom Collecting for Beginners. Canada Dept. of Agriculture, Ottowa, Ontario.

Smith, Alexander H. 1963. Mushroom Hunter's Field Guide, University of Michigan Press, Ann Arbor.

Tylutki, Edmund E. 1962. Some Edible and Poisonous Mushrooms of Idaho. Idaho Academy of Science, Moscow, Idaho 83843.

McCALL AREA

By Paul Skabelund, Payette National Forest

MAP: Obtain a map of the McCall Ranger District at the Payette National Forest Headquarters in McCall.

BRIEF DESCRIPTIONS OF PROMINENT LAND FORM FEATURES VISIBLE FROM THE WARREN WAGON ROAD, McCALL RANGER DISTRICT (Tour One)

The valley of the North Fork of the Payette River above Payette Lake was formed by a large valley glacier which flowed southwesterly from the head of the drainage and reached the point where the town of McCall, Idaho, is now located. Glaciation was the most dominant of the land forming processes in forming the topography as we see it today on the McCall Ranger District. This glaciation occurred approximately 15,000 years ago.

Let us begin our tour at the municipal airport just south of McCall. The flat land west of the highway (Highway 55) and continuing on west to and across the river has resulted from the outwash of materials from the melting glacier and from water deposited materials dropped by the river in its wandering over this relatively flat area since the glacial period.

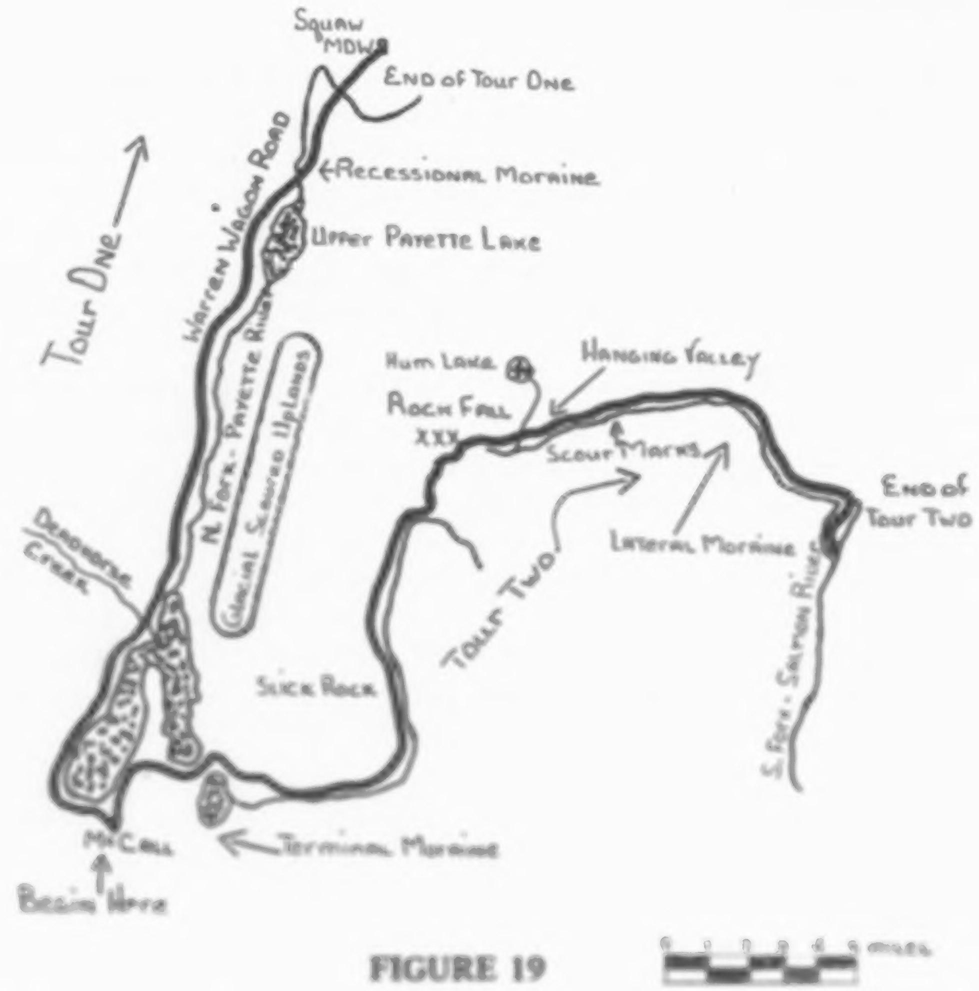

Squaw MDW
End of Tour One
Warren Wagon Road
Tour One
Recessional Moraine
Upper Payette Lake
N. Fork - Payette River
Glacial Scoured Uplands
Hum Lake
Hanging Valley
Rock Fall
XXX
Scour Marks
End of Tour Two
Lateral Moraine
Tour Two
S. Fork - Salmon River
Deadhorse Creek
Slick Rock
McCall
Begin Here
Terminal Moraine
0 1 2 3 4 5 miles

FIGURE 19

The city of McCall sits on the terminal or end moraine of the glacier. This is the farthest downstream point which this ice field reached. As the ice melted at this location most of the rock, sand and other materials carried by the glacier were deposited in this location leaving a mass of unsorted debris or a moraine.

The moraine formed a dam which backed up water in the glacial valley behind the moraine and formed Payette Lake. Eventually the river overflowed the dam and cut an outlet channel at the lake's southwest edge. As you travel through McCall, note some of the steep roadcuts. The moraine is made up of unsorted rock and soil material that you see. This glacial debris is known as till.

As you skirt the west edge of Payette Lake on the Warren Wagon Road and cross Deadhorse Creek notice the smooth rock outcrops on the canyon walls west of you. This granite rock was scoured by the valley glacier as it carved the U-shaped trough-like valley of the North Fork. Where vegetation is more dense on the valley sides patches of till were plastered to the canyon walls by the glacier. Vegetation has been able to establish itself on the soils formed from these till deposits.

The most striking feature of the North Fork Payette watershed is the glacial scoured uplands. These occur throughout the drainage but are most clearly seen from the road looking towards the east side of the drainage. They appear as patterned rocklands interspersed with glacial till on which trees are growing. These interesting glacial features have been given the name roche moutonnees. They occur in this drainage below the steep ridgelands and above tree covered mountain slopes with deep till deposits.

The valley bottom between Payette Lake and Upper Payette Lake is covered with deposits dropped by the glaciers and alluvial deposits dropped by the stream. Evidence of the rolling of rocks by water can be seen in the rounded appearance of rubble and gravel in the streambanks and bottoms between the mouths of Fisher Creek and Brush Creek.

The spectacular horns, cirque headwalls, and other features typical of strongly glaciated lands can be seen at a distance along the ridge on the east side of the drainage.

Upper Payette Lake is mainly a result of deep gouging by the glacier in the valley floor. Little moraine material has been deposited by the glacier at the downstream end of this lake. A recessional moraine which was dumped by the glacier as it receded (melted back) up the drainage is evident about one mile above the mouth of the lake. The swampy, lily pad covered, shallow area at the upper end of the lake was probably at one time a separate lake. Through the years natural erosion has cut through the lower end and sediment has nearly filled this area.

Squaw Meadows is another lake area which was formed by a recessional moraine. The road passes through the rocky moraine land and into the meadow which has been filled with sediment so that a meadow now exists instead of a lake.

As the road climbs out of Squaw Meadows it passes through ground moraine lands that are highly variable. Road cuts show materials that vary from straight sand and other fine sediment to very large glacial boulders floating on or mixed with the soil. In this area Squaw Point may be seen through the trees to the north. The slopes of this peak have been only slightly glaciated as much of this peak's south side were never covered with ice that moved to any large extent.

BRIEF DESCRIPTIONS OF PROMINENT LAND FORM FEATURES VISIBLE FROM McCALL – STIBNITE FOREST HIGHWAY NO. 48, EAST FROM McCALL (Tour Two)

Leaving McCall and going east, the road passes Little Payette Lake. This lake was formed by "the valley glacier of Lake Fork Creek in the same manner that Payette Lake was formed. The lake has been raised by man for irrigation purposes. The dead trees around the edges of the lake were killed by raising the lake level.

Just below the Lake Fork Guard Station the hanging valleys of the Shaw Twin Lakes can be seen to the southeast. These hanging valleys developed when the U-shaped glacial valleys tributary to Lake Creek were undercut by the main glacier which had cut to a much deeper level. When the ice melted the tributary valleys were left hanging above the level of the main valley. Lake Fork itself flows in the bottom of a U-shaped valley, the sides of which have been greatly over-steepened by ice carving and on which little till has been plastered. Slick Rock Mountain is a good example of this over-steepening. In addition this particular feature has received extreme scouring. The valley bottom along the main creek exhibits the deep soils of moraine and alluvial origin. These areas serve as buffers or sponges to control the high amounts of surface runoff which occur on the glacial scoured areas above.

As the road switches out of the stream bottom to cross over Lick Creek Summit it passes through glacial plastered mountain slopes. Glacial scoured uplands or roche moutonnees and highly glaciated cirque headwalls, horns, cirque basins, and rocklands can be seen across the way to the west.

Summit Lake on the west at Lick Creek Summit has been scooped out by ice digging on the drainage divide.

The road then enters the spectacular valley of Lick Creek. After switching down and across the head of Lick Creek a steep rock strewn slope is evident just north of the road. Just what caused this large rock slide is unknown but certainly the over-steepening of the valley walls by glacial cutting made the area much more subject to the forces of gravity.

The road continues down the north side of Lick Creek on the face of this over-steepened glacial trough. At Hum Creek the stream can be seen cascading down over the hard scoured granite face of the canyon. The east face of the hanging valley of Hum Creek ends abruptly in a high ledgy point where it was cut off by the main glacier of Lick Creek.

Across the way Cly Creek can be seen falling off into Lick Creek from its own U-shaped hanging valley. Cirque glaciers in the head of this valley have scooped out basins which contain the Cly Lakes. These lakes are surrounded at their upper ends by cirque headwalls which form shear rugged cliffs. The scenery in the heads of these basins is highly spectacular.

Tsum Creek and Prince Creek repeat the same conditions that have been seen at Cly Creek. On the south canyon wall between Tsum Creek and Steep Creek parallel marks left by the downstream scouring of the glacier can be seen on the bedrock of the canyon walls.

As the road drops into the valley bottom deposition of the glacier can be again seen. Soils of glacial till origin are evident at many places along the road. A large lateral or side moraine is present, although not evident from the road, on the south side of Lick Creek just below the mouth of North Fork. The creek skirts this moraine and then turns sharply to the south.

From this point downstream there is little evidence of glaciation. Evidently the effects of alpine glaciation, if it occurred in this area, have long since been destroyed by the other erosional forces (mostly stream cutting) in this area.

Because these lands were not glaciated they are much less stable than the glacial lands. Most all of the rotten, decomposed rock materials were removed from the surface by glacial scouring at higher elevations. However, in these lower areas this decomposed granite material remains on the surface. The soils derived from this rock are easily eroded and subject to mass movement, especially on the steep faces of stream and river cut canyons. For this reason resource use in this area has been subject to close scrutiny in recent years. Much of the sediment evident in the South Fork of the Salmon River upstream from the mouth of the Secesh can be attributed to road building and logging on similar areas. The instability of these lands can be seen in the large roadcuts along the Secesh river between Ponderosa Campground and the mouth of the Secesh River. Note also the shallow depth of the soil in these areas; even though in many cases these sites are growing fine stands of timber often the roots of the trees must grow into bedrock so the trees can survive.

ROCKY CANYON

ALDAPE SUMMIT AND ROBIE CREEK

This trip, which begins in Boise, will take you up Rocky Canyon and across the Boise Ridge, which is largely composed of quartz monzonite and granodiorite of the Idaho Batholith. Since the elevation changes from 2,700 feet in the city of Boise to over 4,800 feet at Aldape Summit, and the annual precipitation varies from 12 inches to 20 inches as the elevation changes, there is a corresponding change in zones of vegetation. Because of the rapid rise in elevation, and probably because this is primarily a west facing slope with good exposure resulting in relatively higher temperatures, not all plant zones are represented. However, within a distance of less than 10 miles, five of the ten zones described by Daubenmire as being typical of Idaho may be observed (see page 11 for description of vegetation zones of Idaho). This area should be studied to determine exactly why some zones are present and why others are missing at elevations where they might otherwise be expected; its accessibility to students and teachers of Boise Valley high schools and colleges should facilitate such a study. All the factors of geology, geography, soil type, amount of precipitation and run-off, temperature ranges, interference by man, and others should be included in a complete ecological study.

As you leave the city of Boise, the road at first passes through the lowest zone, sagebrush-grass, which is typical of the unirrigated portions of the Snake River Plain. This grades into the second zone of wheatgrass-bluegrass; then as you begin to climb higher, several zones are skipped and you go directly into the ponderosa pine zone, lowest of the true forests in Idaho, in which small shrubs and herbs comprise a well-developed ground cover among the trees. The lower fringes of the Douglas fir zone are always in contact with the ponderosa zone and this is apparent here. On the other side of the summit as you descend and approach Mores Creek, vegetation on the north-facing slopes is of the shrub aspect of zone 3, fescue-wheatgrass.

The variety of plant zones makes this route ideal for field study, and not only can observations be made of individual plants, but plant communities as a whole can be studied.

0.0 Start at the corner of Reserve and Fort Streets in Boise.

To the southwest, in front of the Woman's Clinic on the corner of East Jefferson and Reserve Streets, is a large sequois (redwood) tree, the only mature sequoia in Boise, and possibly the only one in the state. (See photograph, Figure 20).

Go east up the hill past the Armory on Reserve Street, which becomes Shaw Mountain Road and circles the hill to the right.

1.4 There is a viewpoint to the right from which the entire Boise Valley may be seen.

1.7 Road to the right leads to Tablerock, a ridge of resistant sandstone.

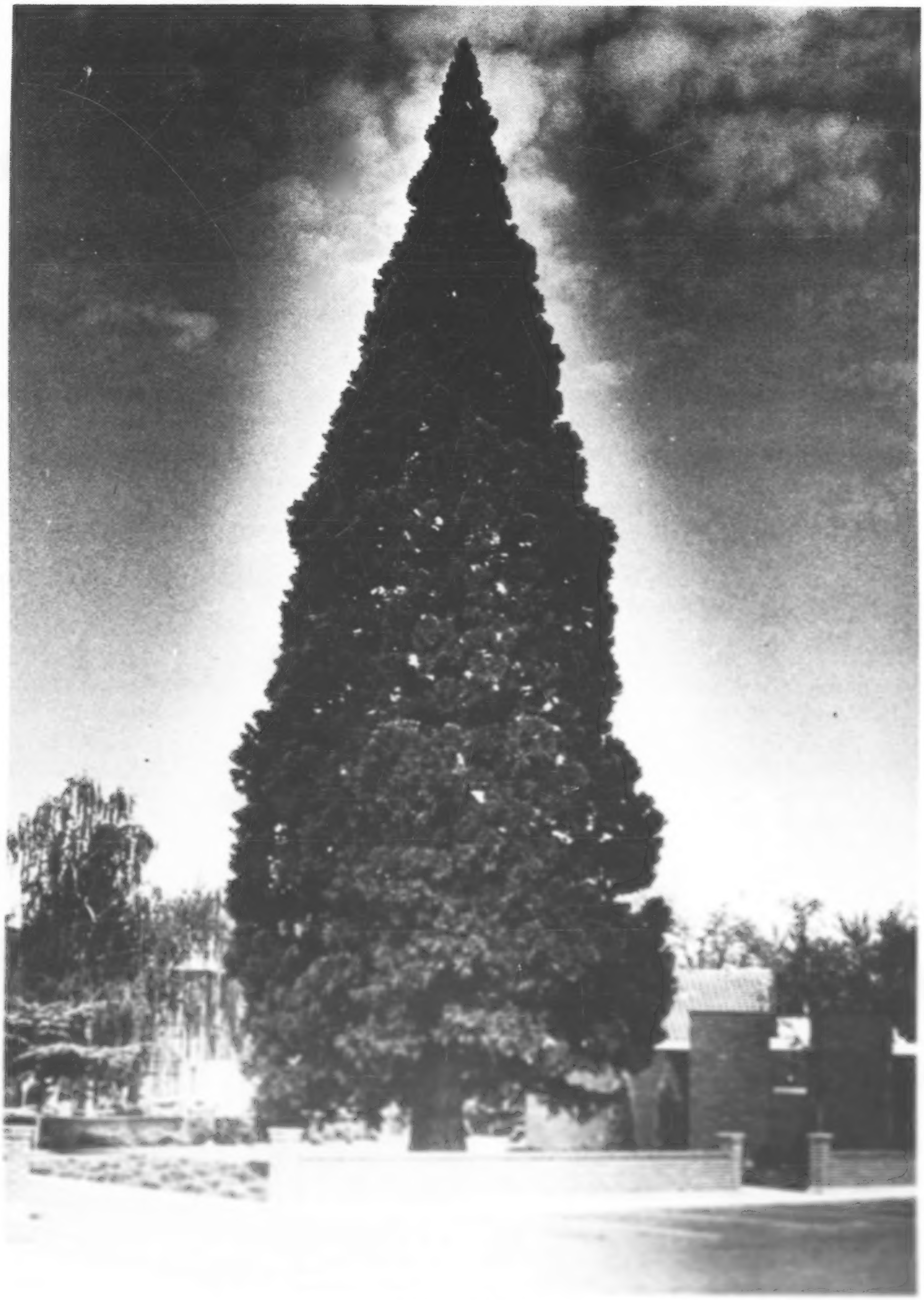


FIGURE 20
Mature sequoia, corner of East Jefferson and Reserve Streets, Boise, Idaho
(Bob Lorimer photo)

2.1 The first portion of this trip is through the sand, silt, and clay of the Idaho Formation. By looking ahead down along Cottonwood Creek, evidences of past flooding and erosion can be seen. This canyon is a good example of the type of topography which exists all along the Boise Front. Fires which removed all the natural cover on the hills, followed by heavy rains, have in the past resulted in disastrous floods and mudflows in Boise. This story is graphically portrayed in the film, When the Pot Boiled Over, available from the Boise National Forest Office in Boise.

Plans have been approved by Congress for construction by the U.S. Army Engineers of a dam on Cottonwood Creek with a 43-acre reservoir. The reservoir will store flood waters and release them through the outlet at rates that will not exceed existing downstream channel capacities. There will be no permanent pool. The dam, an earthfilled structure 96 feet high and 480 feet long, will be located approximately 700 feet upstream from the mouth of the canyon, just below the confluence of Cottonwood and Freestone Creeks about one mile downstream from this point (just above the Veterans Hospital).

The estimated Federal cost of the project is $867,000. Non-federal costs are estimated at $130,000. Actual start of construction is dependent on appropriation of funds.

2.2 Cross Cottonwood Creek. Look straight ahead and notice the manmade terraces on the high hills. What is the purpose of these terraces?

2.9 Note the small outcroppings of small basalt – black jointed rocks covered with lichens. This is an igneous rock, Columbia River Basalt, probably extruded on rather steep original slopes. The basalt flows have been eroded extensively, leaving only isolated remnants in this area.

3.1 Junction of Picket Creek and Cottonwood Creek. Note diatomite deposit (whitish-gray outcroppings) to the right across the Creek. (You can drive to it and examine it more closely if desired.) Pure diatomite is a white chalky organic rock formed from the silica shells of tiny, microscopic, single-celled plants – diatoms – which live in fresh or salt water. It is generally found in beds of limestone and clay. Because of its hardness and porosity, it is used commercially in polishes and scouring soaps, as a filter, fillers in paper, plastics, rubber and cement, and for both heat and sound insulating. It has been mined commercially in Ada and Canyon Counties as well as in other areas of the state.

3.3 Note the first outcroppings of Owyhee rhyolite, an igneous rock which is very colorful, and generally shows flow structure (which can be seen easily in rocks along the road). This is the beginning of Rocky Canyon. Up to now, the vegetation visible on the hills has been that typical of the unirrigated portion of the Snake River Plain, such as sagebrush, bitterbrush, rabbitbrush, and giant rye grass. Also typical of this zone (sagebrush-grass zone) is the kind of vegetation seen along the stream which provides moisture – willows (which are predominant), many berry-bearing shrubs and at this point, poison ivy on both sides of the road.

Dave Levy was a prosperous and secretive man who had a drinking place in Boise in the late 1800's. One time when a new sidewalk was being laid around his dwelling, he astonished the workmen by asking them to raise a part of the walk and thereupon lifting a pot of gold. From this, and because he often rode in Rocky Canyon, came the legend that he had buried most of his wealth; and when, following his murder in 1902, the administrator of the estate was unable to find the money that Levy had been known to possess, it was suspected that most of it had been hidden in the Canyon. Since then many persons have explored there, and even today a favorite pastime with some is a day spent in Rocky Canyon searching for Levy's gold.

3.5 First exposure of the granitic rocks of the Idaho Batholith on both sides of the creek – notice the vertical jointing. Vegetation along here includes mullein, nettles, sedge, and in the spring, the small yellow monkey flower, large yellow flower of the arrowleaf balsam root and tall yellow western wallflower.

5.4 Pull-out to the left is a good stopping place along the creek for closer observation. Notice the difference in vegetation (amount and type) between the north and south slopes. What are some of the factors that might account for this? Other shrubs and plants of this area are black chokecherry (which in the spring has a long white flower hanging down), purple larkspur (delphinium) which is poisonous to cattle when it first blooms, syringa - the state flower (a red-barked bush which blooms in June and July), and bitter cherry (small white flower).

6.3 Note formation of eroded granite to the left of the road.

7.2 Entering Boise National Forest. A few scattered ponderosa pine begin to appear on the hillsides.

7.4 Trees now evident along the creek are quaking aspen and large cottonwoods; many bushes of serviceberry; Douglas firs across the creek.

7.8 Grayish-white outcropping in the roadcut to the left is probably diotomite. Note mine tailings (pile of sand) across the creek.

8.0 Aldape Summit - about 4800 feet. Note the striking change in kind and amount of vegetation after crossing the top of the ridge. Now besides the heavy concentration of ponderosa pine and Douglas fir there are numerous shrubs and plants: mountain maple, Oregon grape, arnica, (once used extensively as a fever-inducing drug), yellow bell (yellow fritillary), wood sorrel, water leaf, dog-toothed violet and many others.

9.0 Robie Creek (Barrel Springs): an old stage stop on the Idaho City-Boise Stage route. Site of the Conservation Tour for 6th graders sponsored by the State Outdoor Education Committee. Stop here and walk along the stream: note soil profile in pit along the south side of the road; observe the marked contrast between the south – facing sagebrush covered hills and the forest north and east facing slopes. Can you explain this? Lie flat on the ground and look for "bellyflowers," the tiny flowers that grow only an inch or two above the ground. Note the variation in size and structure of the flowers, stems and leaves of the many different species.

10.6 Farm and cabins on the right.

11.3 Note signs of erosion and flooding from creek which comes in from the north. Note bare northern slopes. Why is there such a marked difference in the amount of vegetation on the higher and on the lower slopes? (fire? replanting? grazing?) What about the difference between the north and south slopes? And also along the creek and on the side slopes?

11.7 Road to left goes to the Pines, Robie Creek Store (about 2½ miles) and Karney Lakes (a private lake summer home area) and follows the North Fork of Robie Creek. Continue straight ahead.

13.1 Robie Creek State Picnic Area. Large and nicely kept with lawn, tables, restrooms, and a protected swimming area with separate area for boaters. This is located at the point where Robie Creek enters one branch of Lucky Peak Reservoir.

13.3 Note distinct layers in lava flows ahead, and the talus slopes of broken lava. Talus is rock that has been weathered or broken up but not transported away.

14.0 Spring along the right side of road – note the moss.

This is part of the old Idaho City Highway which had to be relocated on higher ground when Lucky Peak Dam was built.

14.3 Small picnic area with tables and restrooms, on left side of road along Mores Creek.

15.0 Another small picnic area with tables and restrooms along the stream.

15.6 Junction with State Highway 21. You may turn left for Idaho City, or turn right and return to Boise by Lucky Peak Dam.

See Thorn Creek Field Trip Guide for further road log.

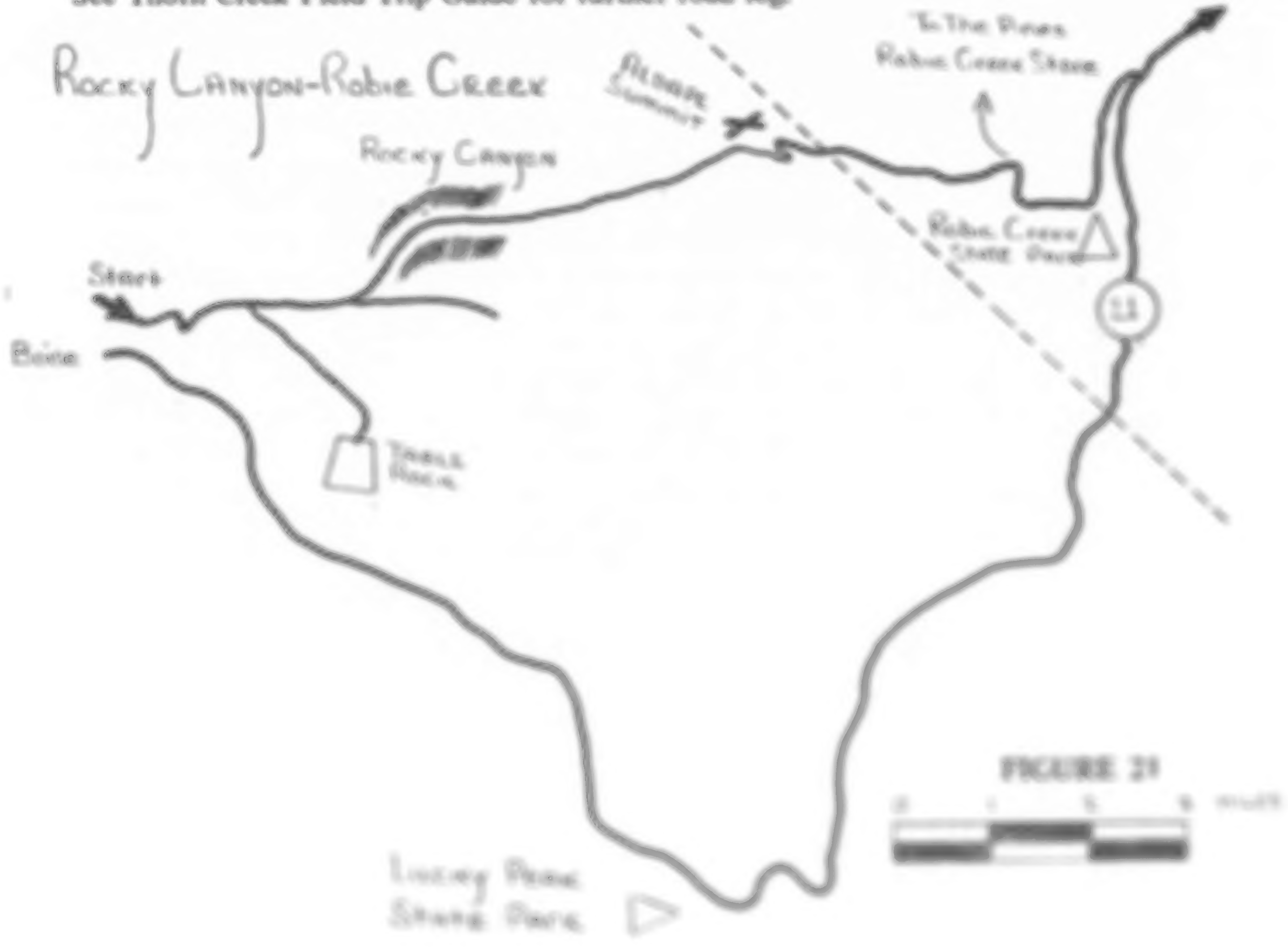

Rocky Canyon-Robie Creek
Aldape Summit
To The Pines
Robie Creek Store
Rocky Canyon
Robie Creek State Park
21
Start
Boise
Table Rock
Lucky Peak State Park
0
miles

FIGURE 21

BOISE TO HORSHOE BEND AND EMMETT

Based on a Boise State College Geology Department field trip
under the direction of Dr. Mont Warner.

MAPS: Boise 15'
Cartwright Canyon 7½'
Horseshoe Bend 7½'
Montour 15'

0.0 Begin at Boise State College and go west on Highway 44. Pass Lake Elmore west of the Planatation Golf Course (a cutoff meander of the Boise River).

Turn north onto Highway 15. Notice benches and rolling hills to the north.

11.0 **STOP NO. 1**

Junction of Beacon Road – Highway 15. You are now on flat tableland – the terraces of an ancient valley floor; there are both river and lake terraces in this area. The roadcut to the east of the highway shows fine grained clay, due to volcanic (basalt) source and also due to lake sediments. This was a broad area that has been lifted up gently during Pleistocene times. A lake probably formed 10-30 thousand years ago. All the rivers formed deltas where they emptied into the lake. Rolling hills on beyond are also sedimentary, but coarser and older than terraces. Mountains are part of the Idaho Batholith, a little younger than the Sierra Nevadas but older than the rolling hills.

23.0 **STOP NO. 2**

Road cut to the west. Cross the road and face north. Lower strata is colored by iron deposited by ground water. This consists of transported layered arkose sandstone and oxidized mudstone and clay layers. Pleistocene leaf fossils (10-30 thousand years old) are found in soft clay. Notice faults and joints across crossbedded transported layers. Look west-knobs sticking out are cemented by iron, so are harder. Layers on top are still level, for they haven't been uplifted. There are many landslides along this highway. Dislocations of the road have been a continuous problem for the State Highway Department. Evidence of old landslides can be seen on the slopes between the summit and the town of Horseshoe Bend. The landslides are due to water soaking into the top layer of soil, which then slides off the impermeable (impassable to water) layer of clay.

Go through Horseshoe Bend; turn west on Highway 52 to Emmett.

3

33.0 **STOP NO. 3**

Note granite in roadcut to north of road; its layered appearance is due to removal of rocks and pressure; this let the granite expand. There is a narrow dike about 3 inches thick and 8 feet high in the granite to the east.

Now walk east on the highway to view an autolith – an inclusion of granite in more granite. Note joint systems and beginning of pegmatites in some of the granites. Small sill – a horizontal intrusion – about 2 inches wide and 8 feet long near the east end of the granite. There is some exfoliation. Along the road to the north is volcanic material; note talus slopes and columnar basalt.

39.0 **STOP NO. 4**

To the north of road, there is an angular unconformity with gravel on top (brown) over white siltstone (just a few feet east of Roystone Springs). Along the road, there is basalt, and just before the dam, tectonic breccia in road cut: this is basalt rock broken up and then cemented together again. Flat topped hills to the north are terraces; the highway is on another terrace, indicating the area has been uplifted several times.

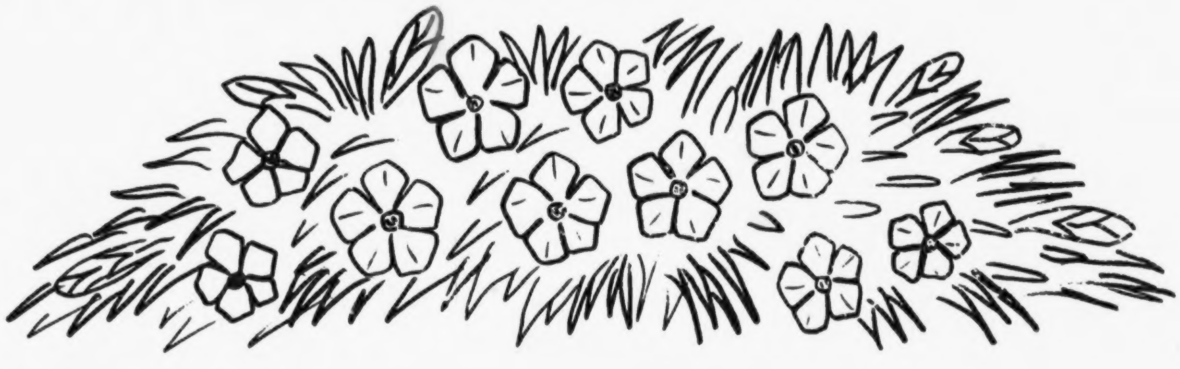
Turn south; go through the town of Emmett, then east, then south on Highway 16 toward Boise.

55.0 **STOP NO. 5**

Stop at highway sign on Freezeout Hill: overlook the broad valley, an old lake of the Pleistocene epoch; hills are of deltaic material – fine grained clays with silts uniformly layered, lignites and bituminous shale.

Cross road to the road cut on the east. Walk south uphill to see faults in road cuts. One main fault is visible in road cuts on both sides. This large fault is one of the most remarkable and accessible in the state. Note the displacement which can easily be measured. Not only can you walk right up to it and examine it closely, you can touch it and "experience" the shifting in layers by feeling the differences in layers. There are many small horsts and grabens near the highway. There are layers of bituminous shale and lignite on both sides of road – most noticeable on the west side.

Return to Boise by continuing south on Highway 16, and then turning east on Highway 44.



BOISE – MOUNTAIN HOME – FAIRFIELD

By Dorothy Reynolds, Jefferson Junior High, Caldwell, Idaho

MAPS:
Mountain Home 15'
Fairfield 15'
Blaine 15'
Boise 15'
Mayfield 15'
Indian Creek Reservoir 15'

From Boise east, U.S. 30 and Interstate 80 go through the Snake River Plain, a Pliocene trough filled with more than 3,000 feet of basalt and deposits that are more than one million years old. These are broadly classified as two large units: the Snake River Group which includes basalt and also gravel deposits during entrenchment of the present Snake River Canyon; and the underlying Idaho Group which consists of sediments mixed with flows of Pliocene basalt.

Note the river terraces to the south. These terraces are unconsolidated sands and gravels, known locally as the "Bench Area". The gravels that make up the river terraces originated in the Boise Range and the gravels decrease in size as you travel south toward Mountain Home, indicating the direction in which the water was flowing.

0.0 Begin mileage at the Gowen Field turnoff south of Boise.

3.1 Interstate 80 divides into 4 lanes. Note the river terraces.

9.9 Outcrop of basalt in roadcut. The lava in this region flowed southwest toward the Snake River.

13.3 Indian Creek Reservoir to the right. Indian Creek originates in the hills to the north. The reservoir was built to store water for irrigating orchards at the railroad junction settlement of Orchard, but the water supply proved inadequate and the venture was abandoned. Occasionally the reservoir fills up and water covers the highway.

The road is now passing over sediments (Glenns Ferry Formation).

13.4 Mayfield-Orchard exit.

Alternate road to Mountain Home goes north through Mayfield and then follows the edge of the foothills past pinnacles of eroded granite. These hoodoos can be seen at intervals all along the road to the north and contrast vividly with the flat surroundings (See photograph, Figure 22).

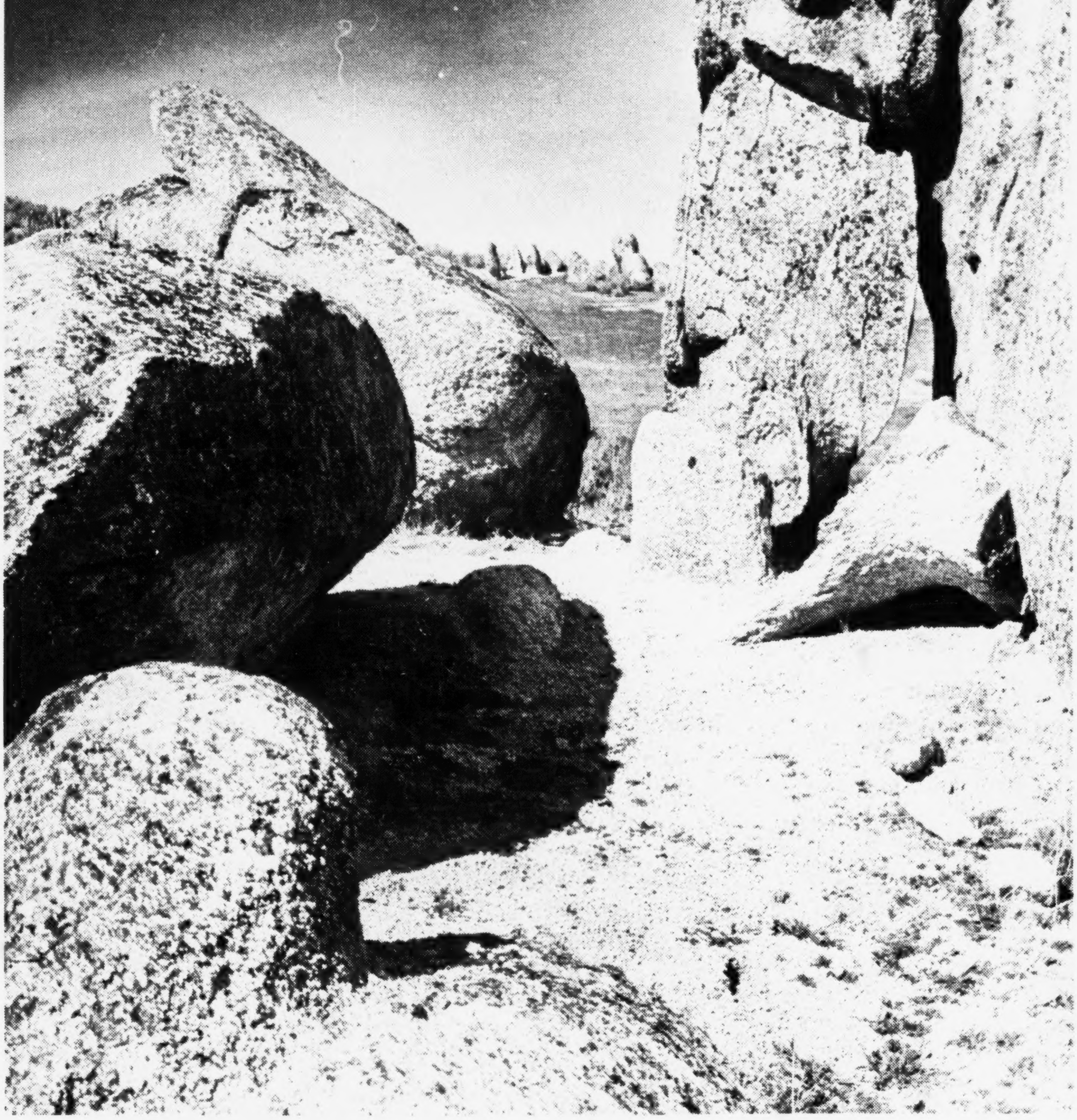


FIGURE 22
Eroded granite on Mayfield Road (Bob Lorimer photo)

Side trip to the south toward Orchard may be taken to Higby Cave, a large lava tube with many small calcite and silica formations. It has been designed as a Civil Defense Shelter for 450 people in eastern Ada County. See Christmas Mountain Quadrangle, 7½', USGS topographic map for exact location.

The Bennett Mountain escarpment is visible to the east. These are 50-mile long mountains northeast of Mountain Home, composed of a thick series of andesite and rhyolite flows. The tilted layers are visible.

21.7 Prominent crater to the right (south) of the highway is Cinder Cone Butte, a double cone of Pleistocene or recent period, much younger than the lava plateau it stands on. It may have been active within recorded time.

28.0 The Crater Rings are two explosion pits approximately 250 feet deep located to the right (west) of the highway. They are unusual volcanic features as no cone is present. The level floors are covered with wind-blown soil. They are not visible from the highway but are located 2.5 miles due south of the Cleft and about 9 miles west of Mountain Home.

28.5 Highway crosses the Cleft Fissure.

To the left (east) of the road, the fissure is closed and one wall stands 10-15 feet above the other presenting a low east-west cliff. To the right (west) the fissure is a chasm in basalt 20 to 20 feet deep, 1 to 2 feet across with no sidewise or vertical displacement. The fault is about 2 miles long.

Lava domes may be viewed on both sides of the road.

33.5 Cinder cones to the right (south). The third crater can be reached by taking old U.S. 30. This crater consists of red and black cinders and is easily seen from the highway.

MOUNTAIN HOME – FAIRFIELD

0.0 Begin mileage at junction of U.S. 30 and Highway 68, Mountain Home-Fairfield Road, in Mountain Home.

10.0 Oregon Trail marker. Site of the Old Mountain Home station known as Rattlesnake Station. From this station the Oregon Trail route proceeded north to the town of Mayfield, and then on to Boise.

13.1 Outcrop of silicic latite. This is an extrusive material that intergrades between rhyolite and basalt.

14.0 Rattlesnake Creek: one of the two streams comprising the surface drainage of the area. Most of its flow is diverted into the Mountain Home Reservoir and is used for irrigation.

Road cut is of silicic latite.

14.7 Tollgate Cafe.

18.8 Junction to Prairie (north) located in Danskin Canyon.

23.4 Basalt flow viewed to the north.

24.4 Anderson Dam road. The dam and its reservoir (approximately 6 miles long) comprise a multiple-benefit facility, providing water, electricity and recreation (See photograph, Figure 23).

Side trip to the Danskin Canyon of the South Fork of the Boise River passes by many Indian caves and pictographs between the dam and the Danskin Guard Station. Symbols of this type are thought to have given the primitive hunter good luck.

27.6 Little Camas Reservoir. This is primarily used for irrigation.

29.6 Junction with road to Featherville. This typical small Idaho mining town may be reached by taking the road to the left which leads up to the South Fork of the Boise River. Evidence of dredge mining can be seen in this area.

Rocky Bar is another small mining town located 5 miles north of Featherville on the Feather River.

Atlanta, 22 miles north of Featherville, is located on the Middle Fork of the Boise River and may be reached from Featherville or from Highway 21 and the Arrowrock Dam Road. Gold and silver mining is still being carried on at Minerva Claims in the vicinity of Atlanta. The dredge piles along the Middle Fork of the Boise River, near Atlanta, are of historic significance. Dredging was done by Chinamen in the late 1800's and the rocks were hand-piled, forming rock walls along the dredge piles.

Continue on main highway.

31.7 Cat Creek summit, elevation 5,527 feet.

Granite towers are seen as you approach the summit. This is an area where the Craetaceous granites meet the basalt of Pleistocene age. (This is also evident in the Mayfield area.)

40.4 Ridge of columnar basalt at Pine Road sign.

44.4 Camas Prairie is an elevated basin built up of many outpourings of rhyolite.

There are many camas prairies in the west (named after the camas root used by the Indians for food) and three in Idaho. Big Camas Prairie is situated in Camas County, giving the county its name and was the main bone of contention that caused the Bannock War. Little Camas Prairie (see mile 27.6) is located in Elmore County and is a continuation of Big Camas Prairie. North Camas Prairie is located in Idaho County and was the scene of the 1877 Nez Perce War.

48.1 Hill City (population 30).

62.9 Fairfield.

63.2 Mormon Reservoir junction.

67.3 Junction of Highway 46 from Gooding.

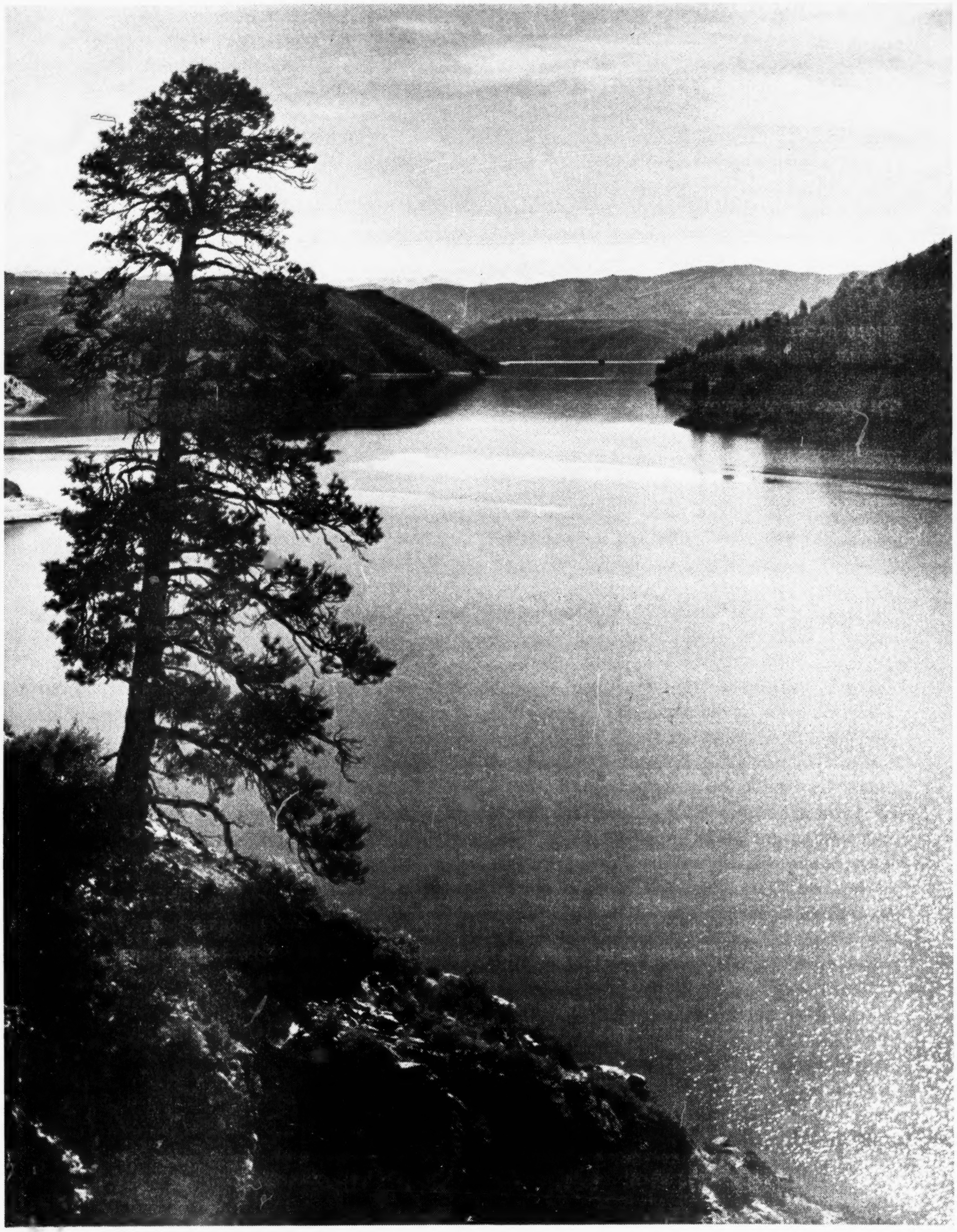


FIGURE 23
Anderson Dam Reservoir, north of Mt. Home (Bob Lorimer photo)

From Highway 46 approximately 12 miles to the south, an access road leads 6 miles west to the Gooding City of Rocks. (The sign pointing to the road leading from the Gooding-Fairfield road, Highway 46, is very difficult to locate.)

The Gooding City of Rocks consists of columns approximately 60 feet high with flat caps at the top and arches and bridges of rocks. The columns were formed by the cooling of a thick rhyolite flow which resulted in deep vertical cracks or joints widely spaced. Weathering, wind and water erosion have enlarged these spaces leaving the tall columns standing apart. There is also horizontal, platy jointing and the thicker plates form mushroom caps that protect the rock pillars.

Continue on Highway 68.

84.6 Magic Reservoir turnoff. Exposure of Banbury Basalt may be seen from the highway. The hills between the reservoir and the junction of U.S. 68-93 have local exposures of granitic rock.

90.6 Junction of Highway 68 and U.S. 93.

Along U.S. 93 to the north lies Bellevue, center for the lead and silver mining in the area. At the present time, there are several active silver mines in the area. The granitic rocks west of Bellevue contributed to the formation of the ore bodies.

The old town and smelter of Muldoon is about 23.5 miles from Bellevue. This district was a center of lead ore production from 1880 to 1910.

Hailey is located in the wide portion of the Big Wood River Valley. The hills that border this town on both sides have facetted spur ends that are probably the result of faulting. The river meanders across its flood plain, swinging against the hills on either side of the valley. It is undercutting on the west side of the valley, causing landslides.

The Milligan and Wood River formations of carboniferous shales are exposed in the Hailey-Ketchum area. These can be observed at the Triumph Mine. This gives the lead and silver mines the deceptive appearance of being coal mines. The Triumph Mine may be reached by turning east (6.2 miles north of Hailey) on the road leading up the East Fork of the Big Wood River.

Hyndman Peak, the second largest mountain in Idaho, may be viewed along this road. This is one of the Pioneer Mountains consisting of Precambrian sedimentary rocks with much younger rock surrounding it.

Beyond Hailey, U.S. 93 leads through Sun Valley and the glaciated Stanley Basin; then up the Salmon River through Challis and Salmon to the Montana border. The geology of this route has been covered thoroughly by C. P. Ross in the Idaho Bureau of Mines and Geology Pamphlet No. 130, Geology Along U.S. Highway 93 in Idaho. The book contains 98 pages of maps, road logs, photographs and geologic descriptions pertaining to U.S. 93 from the Nevada border to the Montana border, and is well worth the price of $1.50.

THORN CREEK FOSSIL AREA

By Dr. Patricia L. Packard, Biology Department, College of Idaho, Caldwell, Idaho

Take Warm Springs Avenue out of Boise – it becomes State Highway 21 at the edge of town. Many of the old Warm Springs mansions were built with Idaho City money and are heated by hot water from the hot springs in this area.

As you round the shoulder of Table Rock at the edge of town, just pass the Idaho State Prison, you will see large dark blocks of sandstone above you on the left. A quarry up the hill once produced building stone widely used in the Boise Valley. (Note the construction of the prison as you pass.) Table Rock sandstone is cemented with silica which resists weathering but the cementing material is scanty so the rock is suitable for building stone only in arid climates. This sandstone was apparently deposited by one of the series of lakes known as the Payette that extended into this region in the Miocene (about 20 million years ago). At one time the site of Boise was many feet under water – note old river and lake terraces above east Boise as you drive through town.

Below the sandstone are the large rounded water worn rocks typical of river gravel. This was apparently deposited by a river older than the lake that deposited the Table Rock sandstone because the lake deposits lie on top of the river deposits.

0.0 Gate City Steel – start mileage count here. On the right, you will note bottom land along the Boise River. The heavy growth of cottonwoods and willows along with some wild rose, red osier dogwood and a yellow flowering currant, and poison ivy indicates there is a high water table along the Boise. This creates a sewage disposal problem for some of the heavily populated outlying districts of Boise that are not yet on a sewer main. Not all rivers in this end of the state have high water tables. The Snake, in most places, has sagebrush growing down to the water's edge.

On the left, behind Gate City Steel, is a red bank. This is probably red basaltic tuff (volcanic ash rock).

1.3 Boise Cascade's Barber Mill is on the right. (For information concerning what may be seen here and how arrangements for visits can be made, refer to the study trip guide.)

From here on up the canyon you will meet logging trucks bringing out loads of yellow pine. Economically, yellow pine (also known as ponderosa pine) is the most important tree in this area because it makes the best lumber under the growing conditions of low altitude mountains and low rainfall.

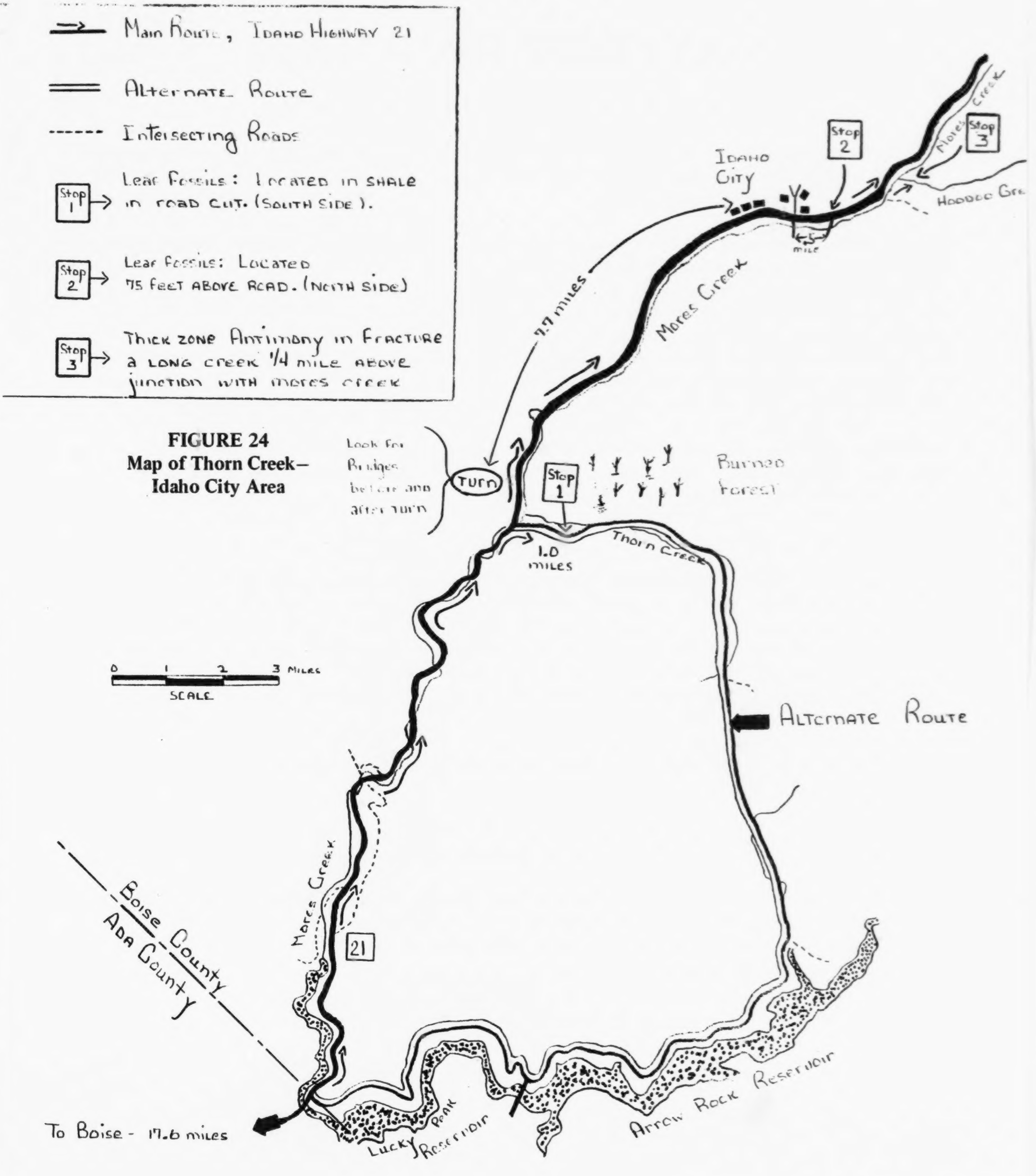

Main Route, Idaho Highway 21
Alternate Route
Intersecting Roads
Stop 1 Leaf Fossils: Located in shale in road cut. (South Side).
Stop 2 Leaf fossils: Located 75 feet above road. (North side)
Stop 3 Thick zone Antimony in Fracture a long creek 1/4 mile above junction with mores creek
Idaho City
Stop 2
Stop 3
Mores Creek
Hoodoo Cr
.5 mile
2.7 miles
Mores Creek
Look for Bridges before and after turn
Turn
Stop 1
Burned forest
1.0 miles
Thorn Creek
0 1 2 3 Miles
SCALE
Alternate Route
Mores Creek
21
Boise County
Ada County
To Boise - 17.6 miles
Lucky Peak Reservoir
Arrow Rock Reservoir

FIGURE 24
Map of Thorn Creek–Idaho City Area

3.0 On the left is the site of Barber; the school house back next to the hill is the only building left. The others were moved to the Gate City Steel area of Boise during World War II. Barber was the former site of the Barber Mill that once handled the yellow pine from the Idaho City area.

3.2 Pullman Brick Company is on the right. Brick is made from the clay taken from two pits nearby. The clay was deposited by the old Lake Payette.

A flat-topped river terrace is visible across the river. Note that a river terrace is not capped by basalt. It was formed because sometime in the past the river developed more cutting power than it had before – either because it was carrying more water or because of the uplift in the mountains causing it to flow faster and with more force. The increased cutting power let the river erode down through the plain through which it flowed. Now only the terrace is left of the former plain.

4.7 Oregon Trail Historical Marker – across the river to the right two terraces can be seen. The front one is the river terrace. The higher one is formed by several flows of basalt. During the Pliocene, very hot lava came from two fissures (there were few volcanoes in this country) on the Boise River and at least one on Mores Creek, and flowed down the canyon, some flows reaching as far as Ten Mile, south of Boise. It solidified into very hard layers of black lava known as basalt. Basalt usually erodes so that there is a vertical cliff, which made it very difficult for the early wagon trains in this part of the country to get to water. The early Oregon Trail (dating back to the 1840's) can still be seen where it comes over the edge of the basalt rim rock at this point.

5.7 Diversion Dam – water for the New York Canal is taken out of the Boise River to irrigate the fields of Ada and Canyon Counties. New York Canal fills Lake Lowell (Deer Flat Reservoir) between Nampa and Caldwell.

Above the highway on both sides at this point columnar basalt can be seen. These columns form as the molten lava cools and always lie at right angles to the cooling surfaces. It is easy to see why basalt erodes so that there is a vertical cliff with talus at the base – weathering loosens a column and it falls over as a unit, always leaving a vertical face.

7.2 River gravel in the exposed cut; this gravel is much smaller than that seen in the roadcut near Table Rock indicating that the ancient river that deposited this gravel did not have the carrying power that the river did at Table Rock. To move rocks, water has to have volume and velocity. The more volume and velocity it has, the greater the load it can carry. Still water, as in a lake, can carry only fine sediments. Gravel deposits indicate the presence of a prehistoric river, sand deposits indicate either a river or a lake large enough for wave action and clay or silt deposits indicate the presence of a lake.

7.5 Lucky Peak State Park to the right. Picnic facilities and rest rooms.

7.6 Approaching Lucky Peak Dam – in the road cuts, the lava flows and river and lake deposits of the Cenozoic are giving way to the igneous granitoid rocks of the Idaho Batholith. During the Mesozoic, a huge mass of granite formed deep in the earth, extending east to the region of the Montana border and north to the Kellogg area, making one of the largest batholiths known in the world. It has since been pushed upward and the layers of rock covering it have eroded away exposing the batholith. Recently the basalt flowed down the river canyon, over the granite-like rocks, forming the dark layer you can see above you as you drive up into the Idaho Batholith. The river then cut through the basalt forming a new canyon below.

Gold and other minerals are usually found in granite rocks like that of the batholith. There is much mining activity in this region.

As you approach Lucky Peak Dam, you see a spectacular spray of water emerging from the dam. This is not just for scenic effect. The rock in this region, as you can see in the roadcuts, erodes easily. The water is broken into a spray to break the force of the water so it will not have too great a cutting power for the stream bed.

8.8 Dark rock intrusions in light colored granitoids. Dark basic magma (molten rock) has intruded, forced and melted its way through weak spots and into the light colored granitoid rocks of the edge of the Idaho Batholith. Intrusions will be seen for about the next eight miles.

Main vegetation in this area is mostly rabbit brush with some sage and bitterbrush *(Chrysothamnus sp, Artemisia tridentata,* and *Purshia tridentata).* Shrubs along the stream are mostly willow *(Salix sp).*

12.1 Hill Top Cafe – you are above the basalt flow now looking down at it. There is a particularly good example of it ahead. The basalt flow marks what was the bottom of the canyon in the Pliocene.

14.1 Lucky Peak Forest Nursery of the Boise National Forest (see study trip guide). Trees for reforestation projects are grown here. Yellow pines *(Pinus ponderosa)* are beginning to appear on the skyline; they will grow at warmer temperatures and lower altitudes better than any other mountain tree in this area. If there is any moisture in the air, the basalt will show a fine growth of yellow-green crustose lichen.

14.9 Highway 21 crosses Mores Creek. To the right there is an observation point with a good turn out.

15.1 Junction with Arrowrock Road.

15.7 The best of the intrusions is on the right side of the road here. Yellow pines are now growing along the river and on the north slopes of hills where there is less heat and evaporation and more water for plant use. South-facing slopes are covered with rabbitbrush and sage. The ecotone between north and south slope is very sharp.

18.1 Old Toll Road Historical Marker – the main road from Boise to Idaho City once made its way over the hill, down the stream, and over the edge of this basalt bench. Aspen *(Populus tremuloides)* are beginning to appear near water, and elderberry bushes *(Sambucus)* grow along the side of the road.

22.1 Buckbrush *(Ceanothus velutinus)* is coming in beneath snags of burned forest. In many places like this, it is the first vegetation to come in after a fire. Buckbrush gives the yellow pine forests their special odor.

22.5 Dunnigan Creek – there is a good growth of Douglas fir on cooler sites from here on.

25.6 Old tailings from placer operations begin to slow up along the creek bed. Fair-sized yellow pines grow on top of the tailing piles, giving some indication of how long the piles have been here. This area has been worked since the 1860's, but in recent years, gold mining hasn't proved profitable although some small operation still continue.

26.7 In places across Mores Creek, the bank has been washed away by big nozzles called "hydraulic giants" or just "giants", shooting powerful streams of water against the hillside. The object was to wash down the gold that had been eroded out of the Idaho Batholith by ancient rivers, then deposited in the old river gravels. The gravel was then run through sluice boxes down by the creek to separate out the gravel.

27.3 Highway 21 crosses Grimes Creek and intersects the road to Centerville, Pioneerville, and Placerville. There is a good growth of fructose lichen, mostly on yellow pines here.

28.2 The edge of the 1960 Thorn Creek Burn appears straight ahead and to the left on the top of the ridge. It has been terraced and seeded with bunch grass to control erosion. Yellow pine seedlings have become established and are doing quite well in the more protected areas.

29.2 Turn out on the left; a large marker gives the history of the 6,880 acre Thorn Creek Burn. This portion has also been reseeded. There is quite a bit of buckbrush coming in here.

PREPARE TO TURN OFF THE HIGHWAY TO THE RIGHT.

29.8 Turn right (east) on the Thorn Creek Road. Good example of weathered granite on the right.

30.2 Road forks – keep to the right. Trees carry good growth of lichen in this area. The black one, *Usnea* or Old Man's Beard, was used as a famine food by the Indians. It is probably not very nutritious and cooks up into a gooey black mess that is best eaten after dark! Most lichens contain an irritating acid which must be leached out before eating. Lichens are epiphytes, growing on trees for support. They are not parasites and are not a moss. They are actually composed of a combination of fungus (usually an ascomycete) and an algae.

Should you be lost, cambium of yellow pines may also be used as an emergency food. Cambium lies between the bark and the wood of the tree and can be obtained only by stripping the bark. This process destroys the tree, so it should be used only in an emergency. It is best for use in winter or early spring, the time of the year when little else is obtainable.

30.8 Thorn Creek fossils are found in the soft rocks in the roadcut to the right just before Placer Creek. These fossils were laid down in the Miocene, nearly 20 million years ago, and this small deposit is the only record we have of what the mountain vegetation was like at that time. **It cannot be emphasized too much that this deposit – and other fossil deposits – should not be vandalized.** These things belong to everyone. When a fossil, or worse still, a whole box of fossils, is picked up and taken home, they are usually lost or mixed up with other fossils so they can never be identified. The information contained in that rock about the past history of our country is lost forever. There is a deposit of Thorn Creek fossils at the College of Idaho in Caldwell. If you find an especially fine fossil has weathered out of the rock and you hate to see it destroyed by weather or picked up by vandals, send it with your name as collector to the College. When enough fossils have accumulated, an expert will work them over and publish the information they reveal. The rock in which the leaves are preserved is an ashy shale.

The forest that grew on these slopes at the time when fossils formed was much like the forests of present-day eastern America. It was largely broad leaf dedicuous tress with a few sequoias growing among them. Over 40 different species have been identified.

Today the main vegetation around you is:

Yellow pine	*Pinus ponderosa*
Buckbrush	*Ceanothus velutinus* (evergreen broad leafed shrub)
Snow berry	*Symphoricarpus albus* (white berries, late summer and winter)
Wild rose	*Rosa sp.* (red, vase shaped berries, late summer and winter)
Red osier dogwood	*Cornus stolenifera* (red twigs, fall and winter)
Willow	*Salix sp.*
Alder	*Alnus sp.*
Fire weed	*Epilobium angustifolium*

Mosses and liverworts grow on the bank itself in damp places.

For more information on this fossil deposit, see references listed at the end of this guide.

31.2 A turn out big enough to park a bus. There is much evidence of placer mining all along Thorn Creek.

31.7 Thorn Creek Camp – includes tables, fireplaces, and rest rooms. Vegetation here is the same as at the fossil deposit with the addition of cottonwood trees. Easy access to the Creek. Mushrooms are sometimes found here. This would be an excellent place to study some of the problems listed at the end of this guide.

Alternate route may be taken from here, but you should check locally first, especially if using a bus.

33.7 Return to highway and continue on toward Idaho City.

39.7 Warm Springs Swimming Pool and picnic grounds to the left (commercial).

Note 300-foot high bluff of cemented sandstone beyond the Warm Springs buildings.

Note tailings from gold dredge on both sides of the road.

41.4 Idaho City Junction. Many historical sites can be viewed in Idaho City. This once roaring metropolis was founded early in October, 1862, about 10 weeks after gold was discovered in Boise Basin. By the next summer, this was the largest city in the northwest, with 6,275 people – 5,691 of them men! Families followed, and respectable businesses, schools, libraries, good theaters, churches, and fraternal orders came soon. The town survived several disastrous fires and remained an important mining center until the war shut down gold production in 1942.

Side trips: More about the history of this area can be learned by visiting the Idaho City Museum, Territorial Prison, cemetery and other historical sites in Idaho City. Information about the Boise National Forest can be obtained at the Idaho City Ranger Station, and visitors are welcome at the Boise Basin Experimental Forest north of town where many problems of forest management are solved (see study trip guide).

Continue on Highway 21 toward Lowman.

41.9 STOP NO. 2

Gray cliffs, about 75 feet high, on the north side of the highway (across the tailings) contain leaf fossils of Miocene age, identified by Roland W. Brown as *Equisetum, Sequoia, Pinus, Populus, Salix* and others* They are in sand and clay lake beds mixed with volcanic ash. The same precautions about collecting apply here as at Thorn Creek. Examine the placer tailings for different kinds of quartz and other minerals. This is just before you enter the Boise National Forest.

44.4 STOP NO. 3

This feature can be seen only by hiking up Hoodoo Creek to a point ¼ mile above its junction with Mores Creek (½ mile from the highway) – not easily accessible and not recommended for groups of students (no place to park off the highway). Deposits of antimony may be found along the creek in a prominent fracture zone about 10 feet wide made up of many parallel fractures with broken rock between. The ore is confined to a vein 2 to 8 inches thick along the wall.

Turn around at the next turn out or campground and return to Boise.

DRIVE CAREFULLY ON YOUR WAY HOME

SUGGESTED PROBLEMS FOR STUDY

1. Note the difference between north and south slope vegetation. What ecological difference might be correlated with this?
2. What are the seed sources in this area after a burn? What plants produce seeds that would reach a burn? By what means would the seeds get there?
3. What animals occupy the different habitats in the area and what do they live on? (Remind classes to replace the habitat and not to become an ecological factor themselves.)
4. What changes might take place in this area in 10 years? 100? 1000?
5. What geological formations and features brought prospectors to this area in the 1860's looking for gold?
6. Where are sand bars located in relation to the bends of the creek and why? Which side of the creek erodes fastest? Why?
7. Pick a tree and describe it as completely as you can. Describe any organisms or plants growing on or around the tree. Do you find any insects? Compare it with other trees in the area as to kind, size, amount of foliage, general condition, etc.

---

*Geology and Ore Deposits of Boise Basin, Idaho. Geological Survey Bulletin 944-C.

8. Examine the soil from three different locations, such as along the road, along the stream, under a tree. How does it differ in color? coarseness? amount of sand? in other ways?

9. How does dredging along a stream (as seen near Idaho City) change it as a habitat for plants? for fish? for other animals (deer, beaver, etc.)? How far downstream does the effect of dredging extend? How could the dredged area be rehabilitated to improve it as a plant and animal habitat and also to improve its appearance?

REFERENCES:

Flora of East American Aspect in the Miocene of Idaho, Helen V. Smith, Bulletin, Torrey Bot. Club, Volume 66, pp 465-481 C-1939.

Miocene Flora from Thorn Creek, Idaho, Helen V. Smith, American Mid. Naturalist, Volume 25, pp 273-522 C-1941.

Geology and Ore Deposits of Boise Basin, Idaho, Geological Survey Bulletin 944-C, printed 1947. May be borrowed from the U.S. Geological Survey Office in Washington D.C., 20242 –No Charge.

The Miocene Trapper Creek Flora of Southern Idaho, D. I. Axelrod, University of California Publications in Geological Sciences, Volume 51, U. C. Press, Berkeley, California C-1964. Price $4.00.

PEARL – WILLOW CREEK DISTRICT

MAP: Montour 15'

The hills which divide the Boise and Emmett Valleys – especially where Gem, Ada and Boise Counties join – provide a variety of geological features and plant and animal life. Several roads lead into the area but the easiest one to describe is the road leading north out of the town of Eagle, which is on Highway 44, 10 miles west of Boise.

0.0 Go straight north from the flashing light in Eagle. The pavement soon ends and you find yourself winding through sand hills.

6.7 After going about 6.7 miles, turn to your right. (By using a highway map and following the map included (see figure 26) you should be able to locate the various features, but don't expect signs and well-marked roads, for there aren't any!) Follow this road along the draw (Big Gulch Creek) and then up into the hills to the north.

In the spring and summer watch for wild flowers. Note the different kinds of plants and grasses. What use is made of this land? Would it make good farm land? Among the widely distributed plant types in this region are sagebrush, winterfat, saltbush, and rabbitbrush; occurring less commonly are greasewood, hop sage, antelope brush, and patches of bunch and blue grass. Black cottonwood, wild rose, western aspen, common cattail, willow, western chokecherry, and staghorn sumac grow along the margins of some of the streams.

9.7 By now you should have reached the viewpoint which overlooks a very short, yet nevertheless spectacular canyon known variously as Red Rock Canyon, Rock Canyon, or Willow Creek Canyon. It is composed primarily of red rocks and it is on the South Fork of Willow Creek so any of the names are appropriate.

Geologically, the canyon consists of a variety of materials, but the main formation is volcanic in origin, primarily Owyhee rhyolite. This silicic (sand-like) rock is reddish-brown, gray to almost black, or pinkish to lavender; it contains perlitic structures, glassy shards and flow layers; the layers are in places folded and contorted quite noticeably. This is the same formation found in Squaw Creek, Succor Creek, and other canyons south of the Snake River in Owyhee County.

The Poison Creek formation immediately overlying the volcanic rhyolite is made up of volcanic ash, clays, shales and sandstone very similar to the Payette formation, but contains fossils of mammals indicating an age of Lower Pliocene (about 10 million years). In some areas, sandstone, conglomerate, arkose and quartzite lie just above rhyolitic rocks.

Less than one mile in length, the canyon is almost 200 feet deep.

Mileage will not be given for the rest of the trip as there are so many alternate routes. Refer to the aerial photograph, Figure 25, and map, Figure 26.

Continue on east and take the road down to the creek. From this point you can easily walk up the canyon. Agates and jasper can be found in the streambed; birds and small animals can often be seen along here; and be sure to watch out for rattlesnakes which are known to be common.

If you turn left (west) at the fork in the road about one mile north of the creek, you can get to the north rim of the canyon and visit the Longhair Mine, a surface operation only, which quarries building and patio stone. If Rocky Joe and/or Bonanza Bill are there, they can show you many beautiful rock specimens and tell you a little about the history of the area.

Indian caves are reported along the sides of the small canyon coming down from the north to join the main canyon. Indian artifacts have been found in many places in these hills.

The road deadends here so you have to back-track about a mile to the other road. There is a jeep trail on north to the Pearl Mining area, but it would probably be best to return to what is shown as the Pearl Road, the one which leads from Eagle. This road continues north and then veers east and goes right through the ghost town of Pearl. On the way, it crosses first the South Fork and then the North Fork of Willow Creek. The North Fork especially yields interesting banded rhyolite, agatized and opalized wood, and jasper and agate of gem quality. It is easy to see how Willow Creek got its name, because of the dense growth of trees along its bank.

Gold discoveries were made in the vicinity of Pearl shortly after the rush to Boise Basin; placers along Willow Creek were probably worked in the 1860's. The first lode development was the Red Warrior Mine operated in 1870, but no important lode deposits were developed until 1894 and

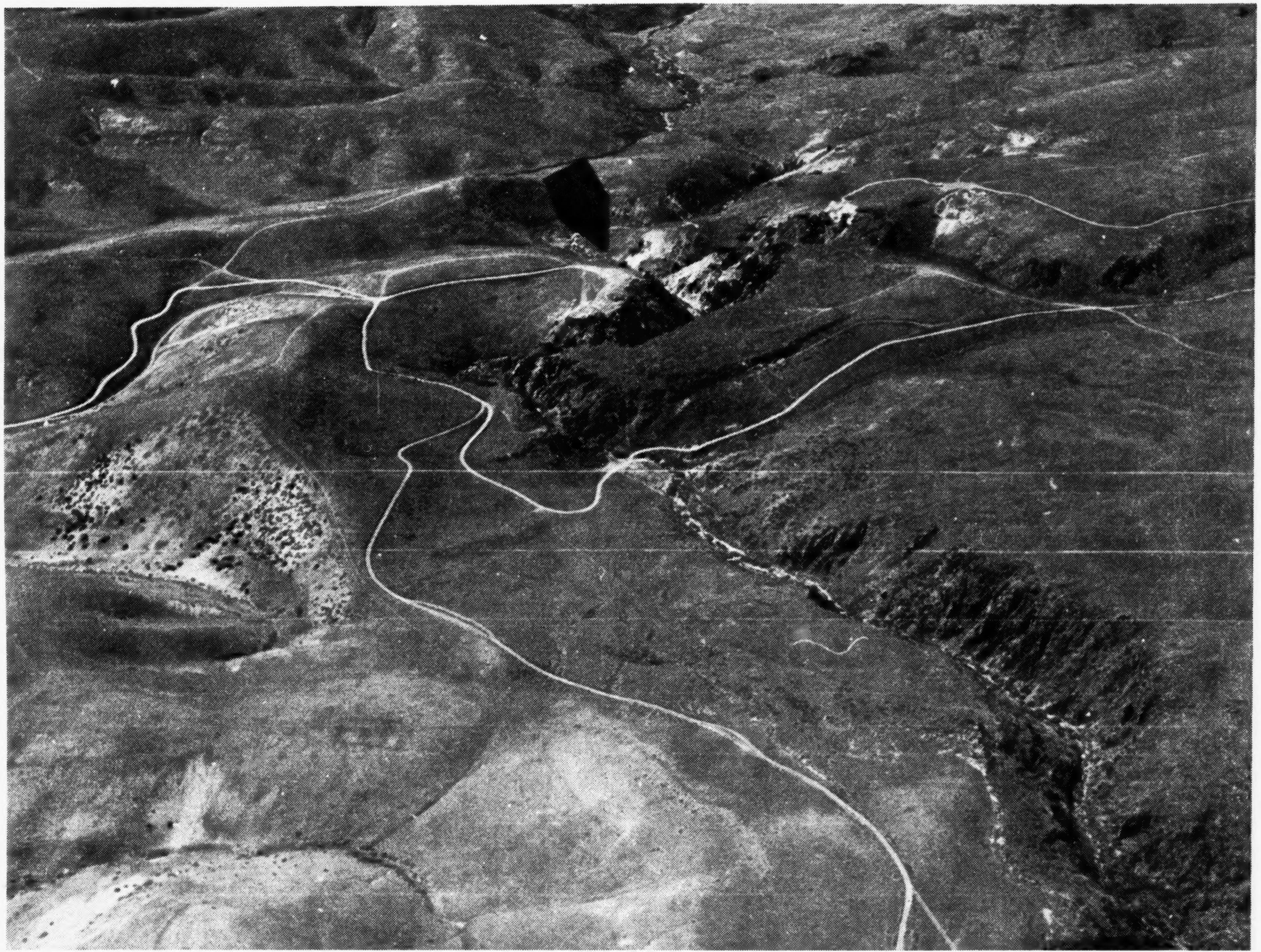


FIGURE 25
Willow Creek Canyon north of Eagle.
Arrow points to viewpoint (Bob Lorimer photo)

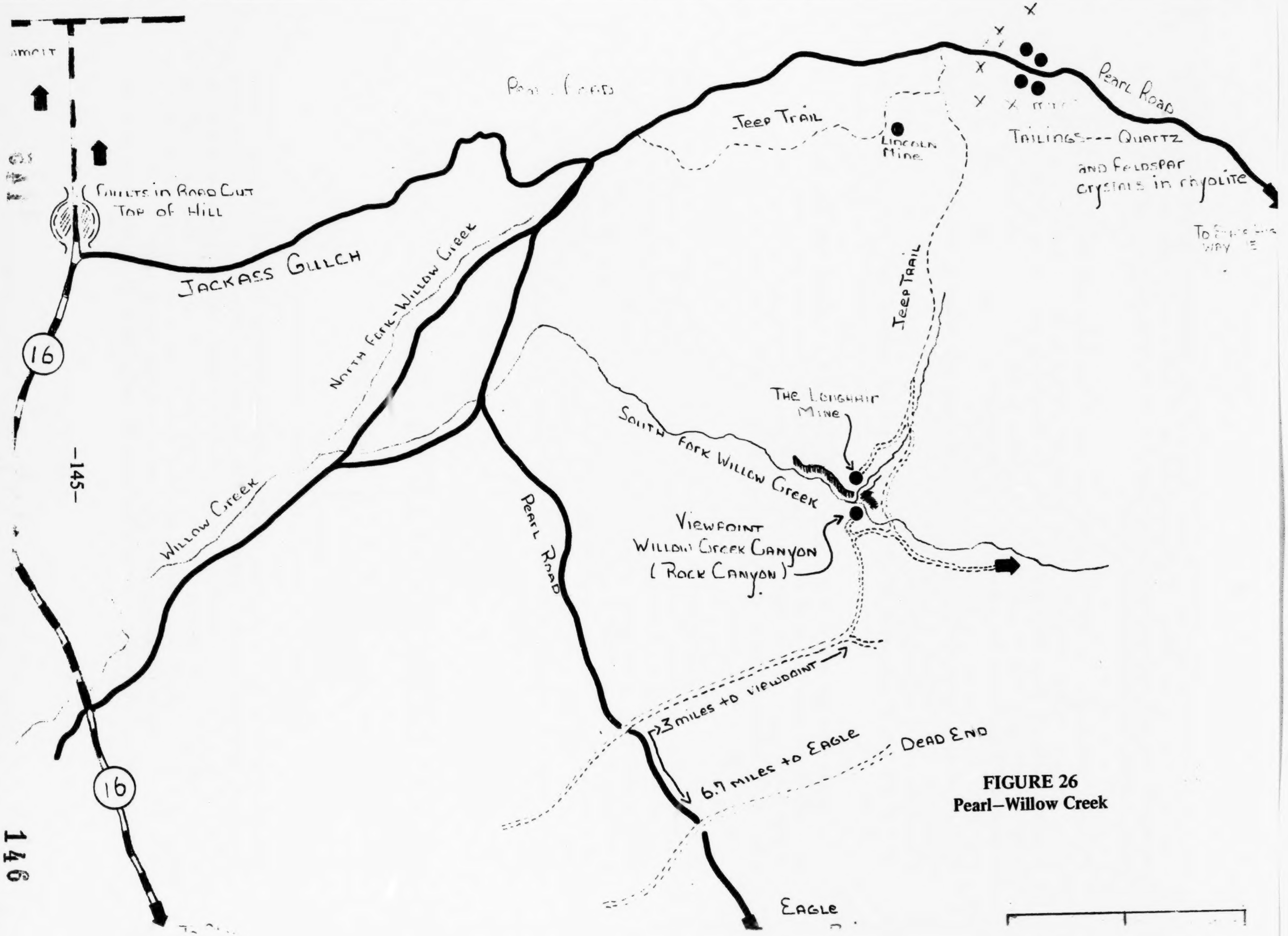

Pearl Road
Jeep Trail
Lincoln Mine
Pearl Road
Tailings--- Quartz and Feldspar crystals in rhyolite
To
Way
Faults in Road Cut Top of Hill
Jackass Gulch
North Fork-Willow Creek
16
Willow Creek
Pearl Road
South Fork Willow Creek
The Longhair Mine
Jeep Trail
Viewpoint Willow Creek Canyon (Rock Canyon)
3 miles to viewpoint
6.7 miles to Eagle
Dead End
Eagle
16

FIGURE 26
Pearl—Willow Creek

1895. Major developments occurred in the period 1900-1907, which seems to have been one of the most important in the history of the district. Unfortunately, past production figures are so incomplete and so variable they are of little value in assessing past activity. At present there is only one active mine in the area, The Lucky Silver.

Pay strict attention to the **No Trespassing** signs, and **do not enter mine shafts** whether they are posted or not. Poking around in mine dumps and tailings is more rewarding and a lot less dangerous, although here, too, you must obey **No Trespassing** signs and be careful not to start slides which might bury you or others. The principal ores are pyrite, sphalerite and galena. Chalcopyrite is uncommon but ruby silver has been recovered.

Much of the rock is full of pyrite crystals that contain low gold values. A very few of the sulfides contain free gold. Most of the gold-bearing veins followed dikes intruded in quartz diorite and granodiorite of the Idaho Batholith – the main rocks of the Pearl area. The Batholith is generally unweathered here in comparison to other regions where it is exposed, such as Long Valley to the northeast.

Dikes ranging from one foot to four hundred feet in width and as much as eight thousand feet long have intruded through the rocks of the Idaho Batholith. Most of these are porphyritic – dacite, granite and syenite. These probably were intruded about 75-125 million years ago. Minerals also found in the area are feldspar, zircon, apatite, magnetite, augite, mica, plus many others, making this an interesting area to explore.

From Pearl, you can take side roads leading to old mines and then return to Eagle; or you can continue on east for about 5 miles to where the road joins Highway 15 at the Horseshoe Bend summit, 20 miles from Boise. Or you can take the Jackass Gulch Road (see map) which brings you out just at the top of the grade going down into Emmett; here you can view the classic fault revealed when a cut was made through the hill for the new highway (State 16) which replaced the old Freezeout Road. This fault is visible on both sides of the road, and many smaller faults can be seen just at road level – the distinct layers in the hillside make it very easy to determine where slippage occurred. From here you can go north into Emmett Valley or you can go south to Star in Boise Valley.

HAGERMAN VALLEY – MALAD GORGE TWIN FALLS

Based on information supplies by
E. G. Crosthwaite, Hydrologist, U.S.G.S. Groundwater Resources Division, Boise, Idaho.

Plans are now being made to develop a State Park at the Malad Gorge in Gooding County. Located just off the proposed Interstate Highway 80, this makes a good starting point for visiting many features of interest in the immediate area. Material for archeology, geology, geography, hydrology, biology and ecology is abundant. Many of these features are plainly marked on U.S.G.S. topographic maps, which are especially good for this area, so it is suggested that if you are interested, you obtain the appropriate maps and go exploring. Undoubtedly you will find many other resources and study sites not mentioned here. The map, Figure 27, included here shows the approximate locations of the features listed below, and the numbers preceding the descriptions are keyed to the map. All of these features are located within a 30-mile radius of the Malad Gorge and the entire tour could be made in one day.

1. To the north is **McKinney Butte**, the extinct volcano that produced the lava that filled the old channel of the Snake River north of Bliss and forced the Snake and Wood Rivers to form a new channel at the Malad Gorge. Later lava flows forced the Snake into new channels to the south; while individual lava flows were seldom more than 100 feet thick, numerous flows are present so the total thickness of lava under the Snake River Plain is several thousand feet in some places.

Directly south of the Butte is a string of caves and collapsed lava tunnels. In the same vicinity are Lye Lake, a waterfilled volcanic cone, and White Arrow Hot Springs.

2. **The City of Rocks**, north of Gooding, consists of columns of weathered rhyolite (see Tour 12, Section 2).

3. **Malad Gorge**, only 2½ miles long, was carved by a much larger river than the one which now flows through it. Stop where Highway 25 crosses the gorge and walk east to see the site of the Kelton Road Trading Post which served wagon trains traveling between the railhead at Kelton, Utah, and Boise. Walk along the river west of the highway to the viewpoint which overlooks the waterfall and pool, the Devil's Washbowl. Then take Highway 25 north to the junction with U.S. 30, go south on 30 until it crosses the Malad River, turn east and take the road to its end up the river to the Idaho Power Plant. Here are springs flowing from the sides of the canyon, and exposures of **pillow basalt**, peculiar structures formed when lava flowed under water. These are rounded masses with a radial or banded concentric structure when seen in cross-section. They are rather uncommon in Idaho but there are several other good exposures in this area (e.g., north of Clear Lake, along the road below the view point). Pillow basalt is especially permeable to water, and the Malad Springs which feed the river here issue from pillow basalt on the south side of the canyon. The basalt columns above the pillows are part of the same flow, but the lavas on top of the columns belong to a more recent flow. The water in these springs and the ones along the Snake comes from the Lost Rivers which sink into the permeable lavas east of Arco, causing the Snake River Plain to be underlain by one of the largest aquifers (supply of ground water) in the world. Where the water table is intersected by the canyons, springs form.

4. **The Fossil Horse Quarry** is situated across the Snake River from Hagerman in old lake sediments. Bones believed to be over 3 million years old have been found here. It is hoped that this, too, will be made into a state park to provide both protection for the remaining fossils, and an educational exhibit for children and adults of the state.

5 and 6. **Fish Hatcheries**: The constant temperature of the spring water which issues from the canyon is ideal for raising trout, so many private and governmental fish hatcheries are located along this stretch of the Snake. See study trip guide for information on the state and national fish hatcheries.

7. At **Thousand Springs**, Idaho Power maintains a small public park and power plant.

8, 9, 10, 11, 13, 14 and 17. **Bonneville Flood**: Evidences of the catastrophic flood that resulted when ancient Lake Bonneville (of which Salt Lake is a remnant) emptied through Red Rock Pass in eastern Idaho are numerous in this area. The mighty river which flowed through here at that time was 200 to 600 feet deep and completely filled the canyons, spilling over onto the plains. At flood

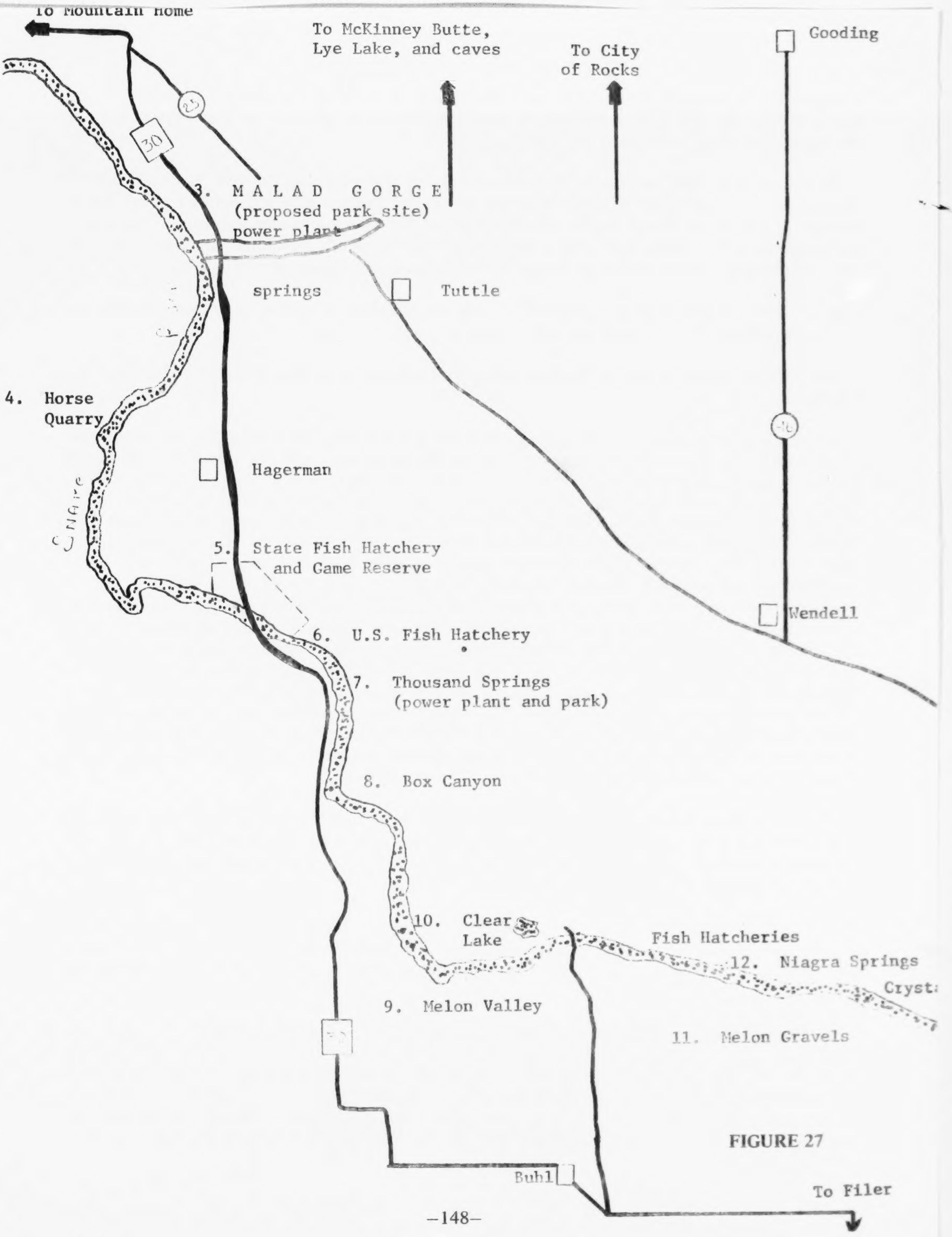
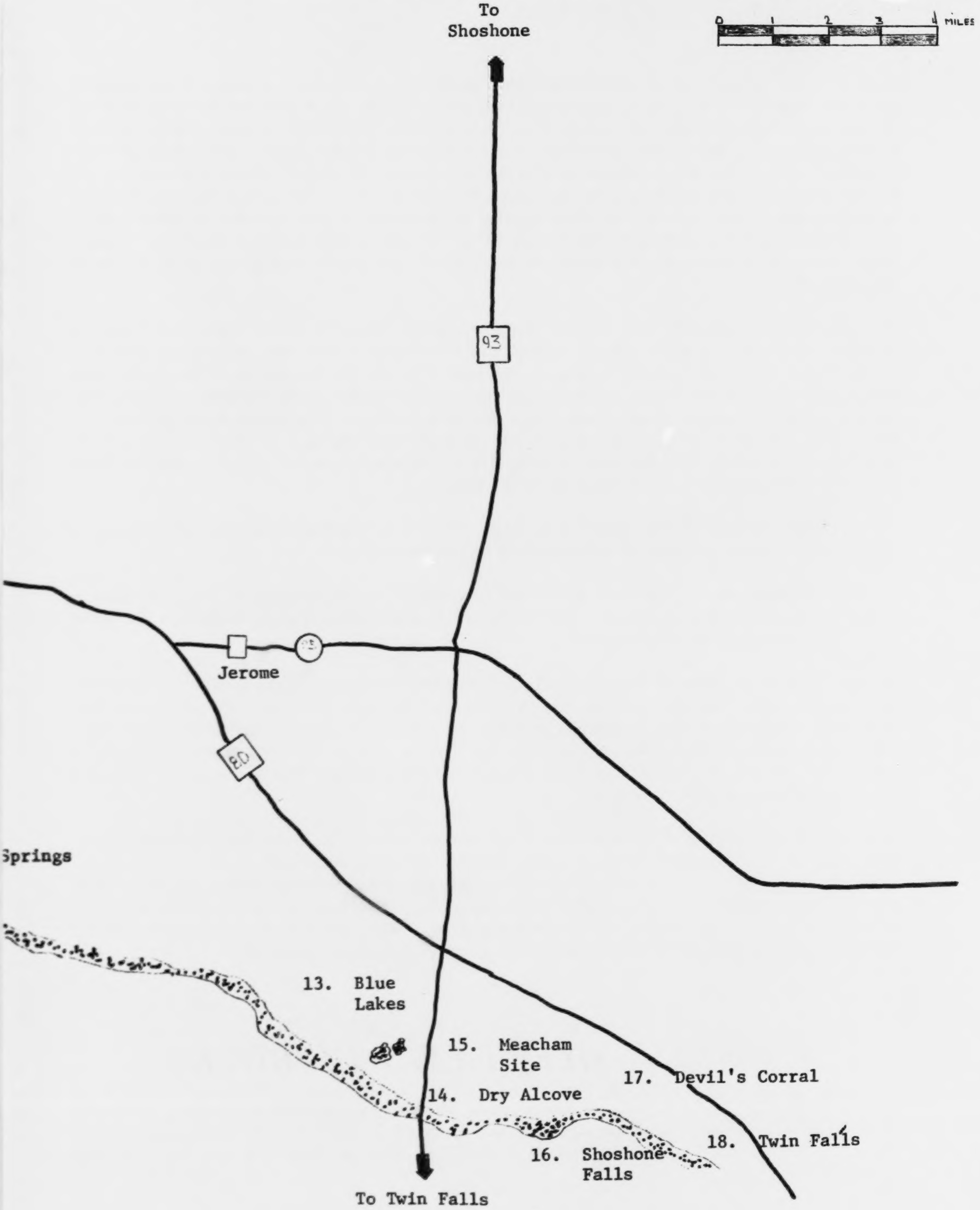

To Mountain Home
30
25
To McKinney Butte,
Lye Lake, and caves
To City
of Rocks
Gooding
3. MALAD GORGE
(proposed park site)
power plant
springs
Tuttle
4. Horse
Quarry
Snake
R.
Hagerman
46
5. State Fish Hatchery
and Game Reserve
Wendell
6. U.S. Fish Hatchery
7. Thousand Springs
(power plant and park)
8. Box Canyon
10. Clear
Lake
Fish Hatcheries
12. Niagra Springs
Cryst
9. Melon Valley
30
11. Melon Gravels
Buhl
To Filer

FIGURE 27


To Shoshone
0 1 2 3 4 MILES
93
Jerome
80
Springs
13. Blue Lakes
15. Meacham Site
17. Devil's Corral
14. Dry Alcove
18. Twin Falls
16. Shoshone Falls
To Twin Falls

stage, it was equivalent to 10 present-day Columbia Rivers. As the flood subsided, water returned from the uplands to the canyon, cutting channels and spillways which now remain along the river as box canyons and dry alcoves. Springs have formed lovely lakes in the bottom of some of these such as Clear Lake, Blue Lakes and Devil's Corral. Others are shaped so that water has no place to collect – one of the best examples of this is the amphitheater-shaped alcove just west of the Perrine Bridge, on the north side of the river (14). All of these offer unique opportunities for geological and biological study, but Devil's Corral on the north, almost opposite the Twin Falls, is an exceptionally good study site, for in contrast to the surrounding desert, a deciduous "forest" grows beside an exceptionally clear pond, so desert, forest, and stream ecology can all be studied in one small area.

Not only did the Bonneville Flood erode, but it deposited. Along its entire length from Pocatello to below Homedale are Melon Gravels, which consist of basalt. These were deposited as eddy bars of fine black sand, and boulders ranging in size from 1 to 10 feet in diameter. The smaller ones which were tumbled for longer distances are the "petrified watermelons" referred to in roadside signs throughout southern Idaho. Debris from the Twin Falls area was carried as far as King Hill before being dropped. In fact, the massive pile of black sand near U.S. 30 (next to the railroad track along the river) 2.5 miles west of King Hill is composed of Melon Gravel. Watch for these deposits of boulders and sand all along the Snake River.

12. The Niagra Springs furnish water for an Idaho Power-Fish and Game Department Hatchery. A shady park with lawn can be used for picnicking or overnight stops.

15. The Meacham site is a shallow depression cave which was investigated by Idaho University archeologists. See their publication, TEBIWA, for more information. This is located on the north side of the river opposite Shoshone Falls.

16 and 18. The Shoshone **Falls** and **Twin Falls** were formed when the Snake cut through fractured basalts to the more resistant andesite. The city of Twin Falls maintains a park with picnic facilities and scenic viewpoints at Shoshone Falls, and the Idaho Power Company has provided a free park with picnic tables, drinking water, restrooms and fishing piers at the Twin Falls. Both can be reached by taking Falls Avenue east from the city of Twin Falls, and then following the signs (4.2 miles to Shoshone, 6 miles to Twin).

In summary, note that all the features listed here are due either to volcanic action or water action, and some are due to both. A good study problem for students would be to see how many examples they can find in this area of the interaction between water and volcanic formation (e.g., pillow basalt, springs, dry alcoves, Melon Gravel, falls, etc.). How these factors determine **man's** use of the area could be the subject of an interesting study – what activities are made possible by the springs? How is agriculture affected? Possibilities for investigation are unlimited.

CASSIA – SILENT CITY OF ROCKS

Located in Cassia County, the City of Rocks can be reached by going south from Burley to Oakley (State Highway 27), then southeast on a dirt road for about 17 miles over the high western rim of the basin; or south from Albion on State Highway 77 to Elba and Almo, and then west. See map on page 151.

These huge erosional forms of granite are enclosed in a large basin thru which Circle Creek winds, and are entirely hidden from view on the west by the high quartzite flank of the Albion Range and partly hidden from the east by a row of hogback ridges. To the north a few miles is Cache Peak (10,541 feet), the highest Idaho mountain south of the Snake River. Over 24 square miles of spectacular scenery with a variety of massive and weird rock forms were carved by erosion from a mountain of granite, a remnant of an ancient batholith. Some of the formations appear as great domed monoliths rising high above the floor of the basin as towers and spires 150 feet high, while others resemble skyscrapers, temples, and fortresses. There are pedestal rocks, natural bridges, caves, hollow boulders, and other sculptured forms.

Along the creek grow reeds, rushes, and wild grasses. The lower mountain slopes and foothills together with the exposed upper slopes and broad basins are largely covered with sage brush, interspersed with grasses and weeds that are utilized for grazing, and studded with juniper, which rarely exceeds 15 feet in height.

On favorable upland slopes where precipitation exceeds the average, there are thick stands of lodgepole pine, Douglas fir, spruce and other conifers. Such patches of timber are seen mostly on the high north slopes of the ranges and only rarely on the high eastern slopes. There are also thick aspen growths along creek bottoms, and mountain mahogany on the rocky highlands.

This area is practically uninhabited and the mountain regions serve as grazing grounds or range for large flocks of sheep and herds of cattle, one of the most important industries in the district.

Lander Trail, Emigrant Trail, and later stage routes passed through here.

Spectacular and unusual enough that it should be made into a state park or national monument, this area is well worth a visit to see the effects of erosion due to wind, rain, and snow.

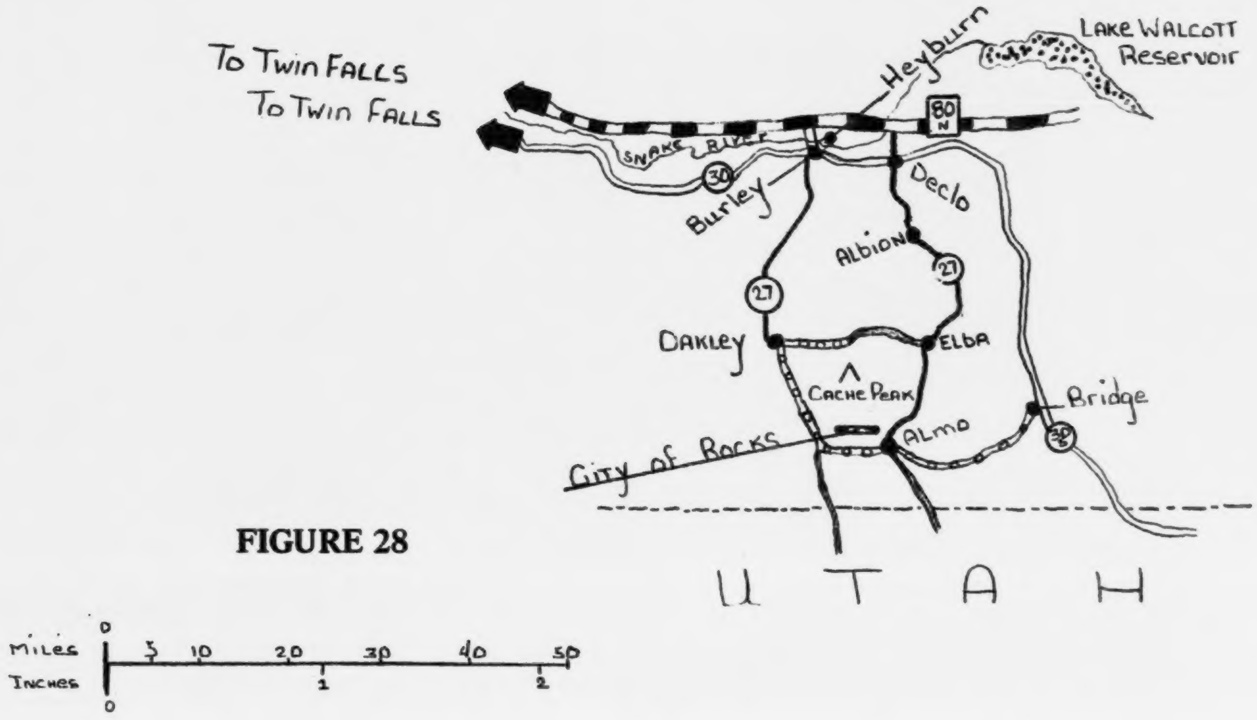
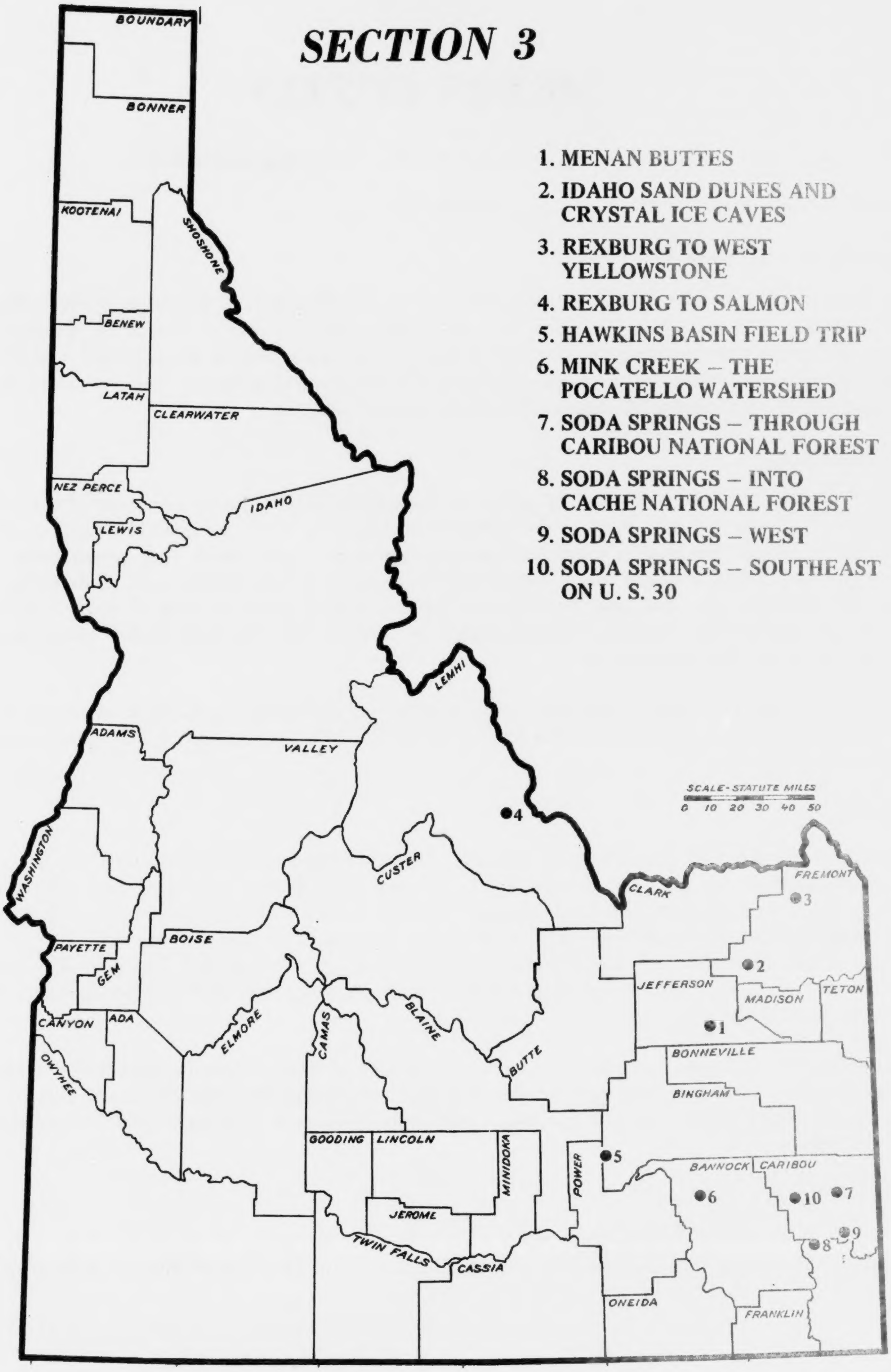


FIGURE 28

SECTION 3

1. MENAN BUTTES
2. IDAHO SAND DUNES AND CRYSTAL ICE CAVES
3. REXBURG TO WEST YELLOWSTONE
4. REXBURG TO SALMON
5. HAWKINS BASIN FIELD TRIP
6. MINK CREEK – THE POCATELLO WATERSHED
7. SODA SPRINGS – THROUGH CARIBOU NATIONAL FOREST
8. SODA SPRINGS – INTO CACHE NATIONAL FOREST
9. SODA SPRINGS – WEST
10. SODA SPRINGS – SOUTHEAST ON U. S. 30


BOUNDARY
BONNER
KOOTENAI
SHOSHONE
BENEW
LATAH
CLEARWATER
NEZ PERCE
LEWIS
IDAHO
LEMHI
ADAMS
VALLEY
WASHINGTON
CUSTER
CLARK
FREMONT
PAYETTE
BOISE
GEM
JEFFERSON
MADISON
TETON
CANYON
ADA
ELMORE
CAMAS
BLAINE
BUTTE
BONNEVILLE
OWYHEE
BINGHAM
GOODING
LINCOLN
MINIDOKA
POWER
BANNOCK
CARIBOU
JEROME
TWIN FALLS
CASSIA
ONEIDA
FRANKLIN
SCALE - STATUTE MILES
0 10 20 30 40 50
1
2
3
4
5
6
7
8
9
10

MENAN BUTTES

By Edmund J. Williams, Department of Geology, Ricks College, Rexburg, Idaho.

MAPS: **USGS Menan Butte quad, 7.5', Shaded relief.**

LOCATION AND DESCRIPTION

The Menan Buttes are located in Southeastern Idaho, 10 miles west of Rexburg, south of Highway 88 in Madison County (20 miles north of Idaho Falls). They consist of five cones which erupted along a north-south trending fissure that shows at least two periods of extrusion. Three older well-eroded cones, about 200 feet high, are separated by two well-preserved younger cones that rise as much as 800 feet above the surrounding Snake River Plain.

FORMATION

These volcanic features are studied by geologists throughout North America because of their unique geology. They were erupted through the water-saturated Snake River flood plain. Eruptions were of a highly explosive nature due to molten magma coming in contact with cool groundwater in the underground feeding conduits. They might have been flows, domes, fountains or cindercones, as all four are found in the area, but instead were formed as tuff cones because of sudden chilling of magma during contact with an abundant supply of groundwater. No molten lava issued from the vents. Tuff cones like these are rare.

The Menan Buttes are truly "glass mountains," being made of small fragments of solid glass formed by sudden chilling of the magma. The glass is of olivine basalt composition, and lends to the dark color of the tuff.

Xenoliths

One or two percent of the volume of the cones is made of xenoliths of river gravel carried upward by the explosions in the vent. Xenoliths are composed of granite, quartzite, and schist derived mainly from weathering of the Teton Range, 50 miles to the east, and carried here by the Teton and Snake Rivers. Xenoliths range from sand size to cobbles more than one foot in diameter. Some found ½ mile from the vent illustrate the explosive nature of the eruptions. The xenoliths were not melted due to the rapid cooling of the magma material, but some show interior banding due to heat metamorphism.

Other xenoliths, as large as 3 feet in diameter, are blocks of basalt. Some are dark red in color, and were probably torn from the walls of the underground feeding conduits. These are part of many earlier lava flows in the area which reach a cumulative thickness of about 5,000 feet beneath the Menan Buttes.

Effect of Wind

Prevailing southwesterly winds have had a great effect on the shape of the buttes. The craters and cones are elongated in a southwest-northeast direction with the craters situated well toward the

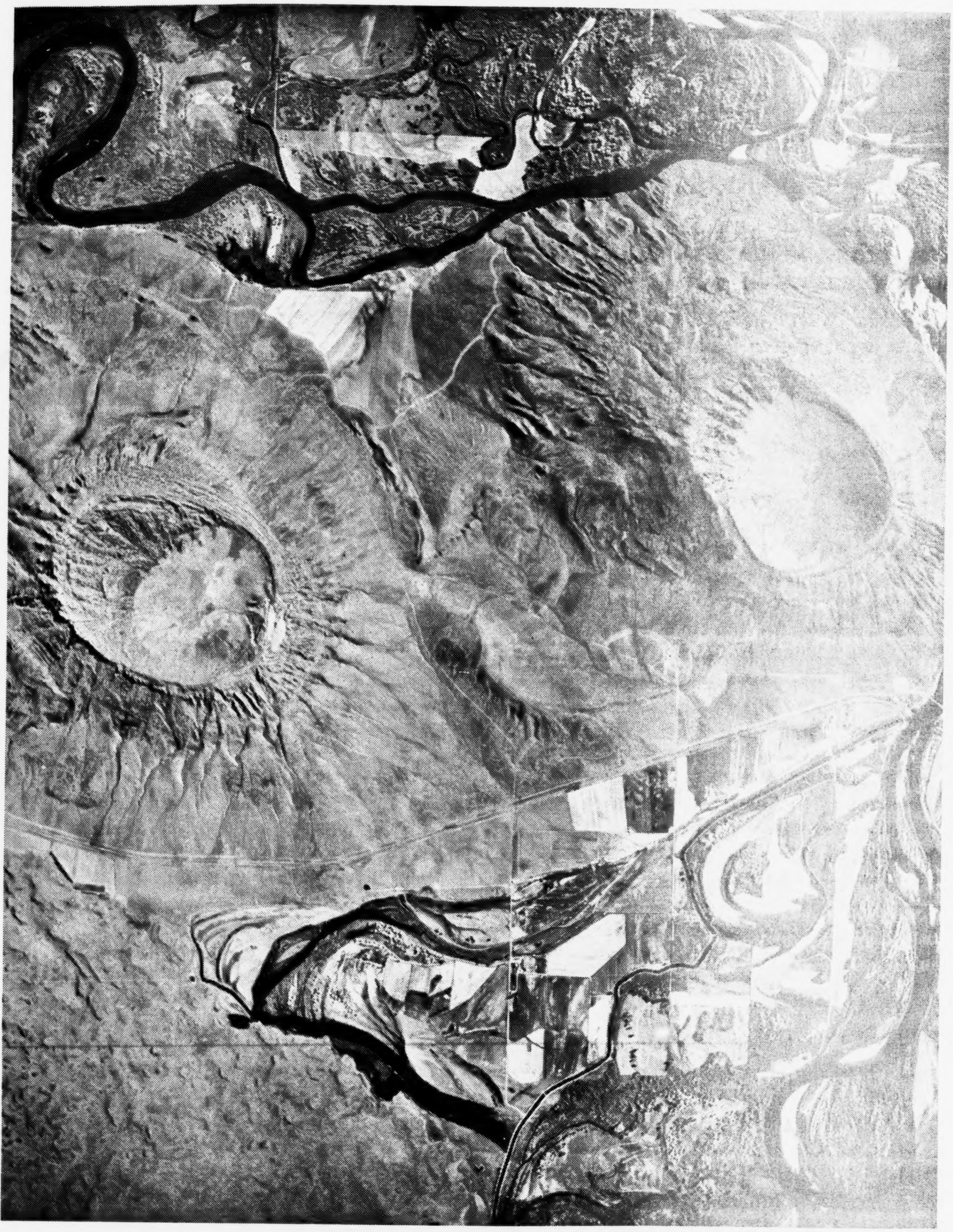


FIGURE 29
Aerial Photograph of the Menan Buttes
Note the meandering rivers, and basalt flow west of the North Butte. (USGS)

southwest side. The highest point on the crater rims is on the northeast side of the vents. This illustrates blowing of pyroclastic ejecta northwestward from the vent by winds.

The second highest point on the crater rim is on the southwest side. Winds blowing during eruption would set up a current of air moving in the opposite direction within the crater. Some material was carried from the vent and deposited on the southeast side, with layers sloping toward the vent. (See Figure 30).

Wind erosion since deposition of the tuff has carved pillars, caves, channels, and large circular basins, particularly on the southwest side of North Butte.

The middle member of the three older cones is partly covered by ejecta from the two younger. The older cones are highly eroded and weathered. The one on the south known as Annis Butte has had the southwest side entirely removed, probably by the meandering Snake River. The northern-most older cone rests on the most recent basalt flow in that area, and is clearly younger. The two younger cones are not as eroded, and radical gullies are not well marked. The two younger cones are probably early Recent in age, with the three older being erupted at an earlier time, probably during late Pleistocene. No radiometric age determinations have been made, but they would give a more precise age for the eruptions.

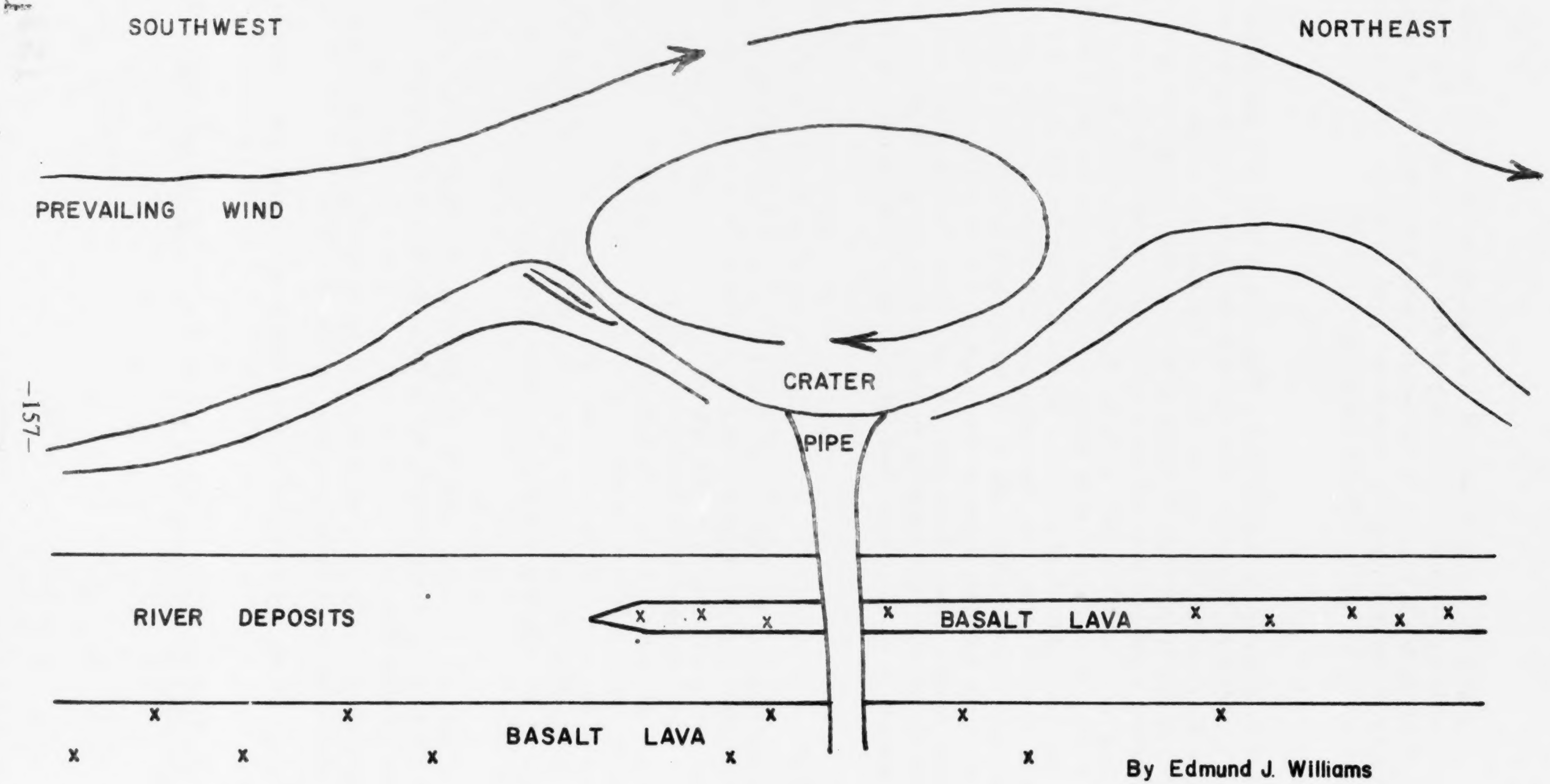
FEATURES VISIBLE FROM THE BUTTES

The following geologic features can be seen from the high point on the southwest side of the North Menan Butte. This is the best side to view weathering, particularly wind erosion. A large circular basin formed by moving air is seen just east of the summit. The light brown cap on this part of the rim probably is the result of the eruption of a tuff with slightly different composition. Bedding slopes toward the vent in this light brown material and shows the circular motion of air in the crater during eruption.

Notice the State Police radio relay tower on the far side of the rim. It is about ¾ mile away, and gives distance relationship. Meanders of the Henry's Fork of the Snake River can be seen directly east of the cone. Note that the river stays close to the fissure eruptions northward, but in the vicinity of the buttes, flows southward around the buttes, then northward back against the flows. It is thought that eruption of the buttes diverted the river southward, and that it once flowed through the area where the north butte now stands. The South Fork of the Snake can be seen joining Henry's Fork just east of the south butte. (See photograph, Figure 29).

Teton Range

The Teton Range is visible on the east skyline. Rocks that make up the core of the range are Precambrian igneous and metamorphics that date about 2.3 billion years ago, making them some of the oldest rocks on earth. The Teton Range is young compared with the rest of the Rocky Mountains. It is thought that the range was built during late Pliocene and early Pleistocene times, with minor growth continuing to the present time. This puts most of the mountain building within the last 2 or 3 million years, as compared with tens of millions of years for the rest of the Rocky Mountains. The range was highly glaciated during the Pleistocene Ice Ages, with about ten glaciers existing at the present time. The Bighole Mountains form the low ridge this side of the Teton Range, and consist of Paleozoic and Mesozoic sedimentary rocks. The largest coal deposit in Idaho is located in the north end of the range.


SOUTHWEST
NORTHEAST
PREVAILING WIND
CRATER
PIPE
RIVER DEPOSITS
BASALT LAVA
BASALT LAVA

By Edmund J. Williams

FIGURE 30
Section of North Menan Butte showing circular motion of air inside the crater.
Note river deposits and basalt lava beneath.

Rexburg

Rexburg, Idaho, is located on the north edge of the Rexburg Bench toward the east. Rexburg Bench increases in height to the south to the vicinity of Ririe to the southeast. The steep slope on the south side of the bench is a scarp of the Grand Valley Fault, that can be seen to curve northward decreasing in height to form the western border of the bench. The fault separates the Snake River Valley, which is a graben, from the higher area to the east.

Snake River Plain

Looking southwest from the butte, the vast Snake River Plain is seen. It is part of the Columbia Plateau which is underlain by lava flows. This area is in the center of an extensive groundwater system, the water going underground near the base of the mountains to the north, and flowing through the highly permeable lava flows to emerge at Thousand Springs near Twin Falls in southern Idaho. Far more water is pumped from this water system for irrigation than flows down the Snake River. In the foreground, an oxbow lake is visible. The meandering Snake River is beyond and flows across a highly cultivated flood plain. During Pleistocene times, the river probably flooded several times a year, covering its flood plain from the lava flows on the west to the low hills on the east, a distance of 10 to 15 miles. Note the several low, dark colored lava domes and cindercones on the plains beyond. The three higher hills on the southwestern skyline were formed by igneous activity. The one on the right (Big Southern Butte) and the one on the left (Eastern Twin Butte) are highly eroded volcano cones. These probably date from Tertiary times, and consist of light-colored rhyolitic volcanics. The middle of the three is a volcanic dome formed by intrusion of material from beneath. It is more recent than the other two volcanoes, and is made of basaltic material.

Mountains to West

The high mountain ranges to the west consist of a series of northwestward-trending, block fault mountains that disappear into the Snake River Plains to the south. They are made of highly folded Paleozoic sedimentary rocks. Starting to the right of the Big Southern Butte is the Lost River Range with Arco, Idaho, at the southern tip. Craters of the Moon is about 20 miles beyond the tip of this range. The next mountain range to the right is the Lemhi Range with its high serrated ridge forming the skyline. Saddle Mountain (elevation 10,235 feet) is the mountain with two peaks near the southern end of the range. The next mountain range northward is the southern extension of the Bitterroot Range called the Beaverhead Mountains. The northern border of the Snake River Plains is formed by the east-west trending Centennial Mountains. All are part of the Rocky Mountain system.

For more information on this area, refer to the following: Hamilton, Warren, and Myers, W. Bradley, Menan Buttes, cones of glassy basalt tuff in the Snake River Plain, Idaho. U.S. Geol. Prof. Paper 450-E: pp. 114-118. 1965.

Love, J.D., and Montagne, John de la, Pleistocene and Recent tilting of Jackson Hole. Wyoming Geological Association Guidebook on Jackson Hole. pp. 169-178. 1956.

Ross, C.P., Geology of the southern part of the Lemhi Range, Idaho. U.S. Geol. Survey Bull. 1081-F. 1961.

Staatz, Mortimer H., and Albee, Howard F., Geology of the Carns Mountain Quadrangle, Bonneville, Madison, and Teton Counties, Idaho. U.S. Geol. Survey Bull. 1205. 1966.

IDAHO SAND DUNES AND CRYSTAL ICE CAVES

By Delbert W. Lindsay, Dept. of Biology, Ricks College
and Edmund J. Williams, Dept. of Geology, Ricks College.

Road log from Rexburg, Ricks College Campus, to Idaho Sand Dunes and Crystal Ice Caves. Driving distance: 92 miles round trip.

The trip can be made in late spring, summer or early fall. Entire trip takes a full day. The area can be reached by automobile or bus, but caution must be used on ice cave road, as rocks protrude quite high on ungraded road. No ropes are needed at Civil Defense Cave, but 100 feet of rope is needed at Waterfall Ice Cave and Crystal Ice Caves. No more than 20 people in a group should try to make it through the ice caves, as it takes too long with the rope work. Each person should have a flashlight. Gas laterns are very useful.

0.0 Ricks College Campus. Travel north out of Rexburg on U.S. 191-20.

1.2 Cross Teton River (South Fork), which is biologically poor, mostly because of stream channel engineering. There are some willows and river bottom plants.

1.8 Turn left on Salem-Parker road.

5.5 River terrace of Henry's Fork of Snake River. Renewed downcutting of the river has lowered the stream channel leaving the old flood plain higher. There are barrow pits in general area which has a high ground water level. Excellent small ponds for algae, aquatic insects, cattails, frogs, including pollywogs, and even small fish. Bird life abundant. Red wing black birds, yellow headed blackbirds, Brewer's blackbirds, native sparrows, and magpies are common; watch for wading birds and ducks in small ponds.

7.4 Henry's Fork of Snake River. Flood plain deposits include rounded gravel, sand, and silt. Just ahead is the north river terrace. Site of Old Fort Henry is about ¼ mile southeast of bridge. Four species of swallows nest under the bridge; some wading birds; a typical eastern Idaho river bottom. Dominant trees and shrubs are narrow leaf cottonwoods, willows, dogwood and hawthorne. Nesting birds of many species are common in river bottom areas. Excellent place to observe migrating ducks during the proper seasons.

7.6 Side excursion: turn left and watch for gravel roads to the river bottoms. Warm water streams in this general area harbor ducks all winter. Excellent algae collecting even in cold weather.

7.9 North river terrace. Note black obsidian sand in road cut.

8.6 Another river terrace indicates an even higher flood plain.

9.0 Note unique irrigation practice for next few miles. The water table is controlled by artificial recharge of groundwater through small ditches running through the field..Water table is adjusted to suit needs and type of crop. No flooding takes place.

11.4 End of oil. End of irrigation project. Start of monument to man's ignorance (city dump); start of lava flows. The road is called the Red Road because it was originally covered with red cinders. Beginning of desert shrub-bunch grass community. Dominant plants include big sage, tree tip sage, varnish leaf rabbit brush, big rabbit brush, three own grass, needle and thread grass, and Indian rice grass. Subordinate plants are many. Desert mosses and lichens are of special interest. Sage grouse strutting grounds begin. Birds can be observed at and soon after dawn in late April and early May. Drive slowly and watch for concentration of birds. This extends northward for many miles.

12.2 Sand dunes on the left. The source of the sand is thought to be the flood plain of the Snake River to the south. The wind blows from a SSW direction, and has piled the sand up in this area. Some dunes extend about 10 miles northeast of this point. The sand is very fine grained and is composed mainly of quartz (milky, rock crystal, smoky, rose, chert) with many other rock fragments and minerals such as obsidian, feldspar, basalt, magnetite, olivine, serpentine, garnet and biotite. Ricks College Department of Geology set up several research plots on the dunes in the fall of 1967. From Oct. 10, 1967, to May 13, 1968, the dunes moved about 8 feet. This is probably more than average for a seven-month period, as the spring of 1968 was rather windy. Juniper and chokecherry form the major large shrubs. Watch for evidence of vegetation being buried and also sand-holding grasses at work slowing down dune movement (see photograph Figure 31).

14.2 Turn left off main road. Straight ahead are higher hills known as the Junipers. These were formed as lava domes, volcanoes, and fissure eruptions. Several small roads branching off – keep right. Destination is red cinder pits on the hill to the west. Excellent chokecherry collecting in a good year. Good floral display in late May or early June. Balsamroot, cactus and Oregon grape very common. Walk to the edge of dunes; excellent kangaroo rat trappings. Pack rats can be taken on the larger lava rock outcrops. Jack rabbits are common.

15.8 Cinder pits: this is the source of cinders for Red Road. Combine geology with wild flower collecting in summer. The rocks are actually scoria derived from fountaining along a fissure located 500 yards wouthwest. It has a basaltic composition with large crystals of plagioclase feldspar embedded in the scoria. These phenocrysts were formed before extrusion of the scoria, as the scoria is formed around the crystals. The fountaining is probably late pleistocene or Early Recent in age, judging from the amount of weathering and the soil profile that has developed on the eruption. A soil profile showing the A, B, and C horizons is seen on the south side of the parking area. Volcanic bombs are common, and some with a diameter of more than 5 feet indicate the lava fountains may have been as high as 1,000 to 2,000 feet. A large pit 200 yards to the south of the parking area exhibits a basaltic dike cutting the scoria. The dike is hollow, with a glazed inner surface indicating a gas phase after the initial intrusion. The following plants have been taken here: *Achillea* (Yarrow), Balsamroot, *Bromus fecton,* cheat grass, *Cryptantha,* Wild Buckwheat, *Erigeron* (daisy), Wild

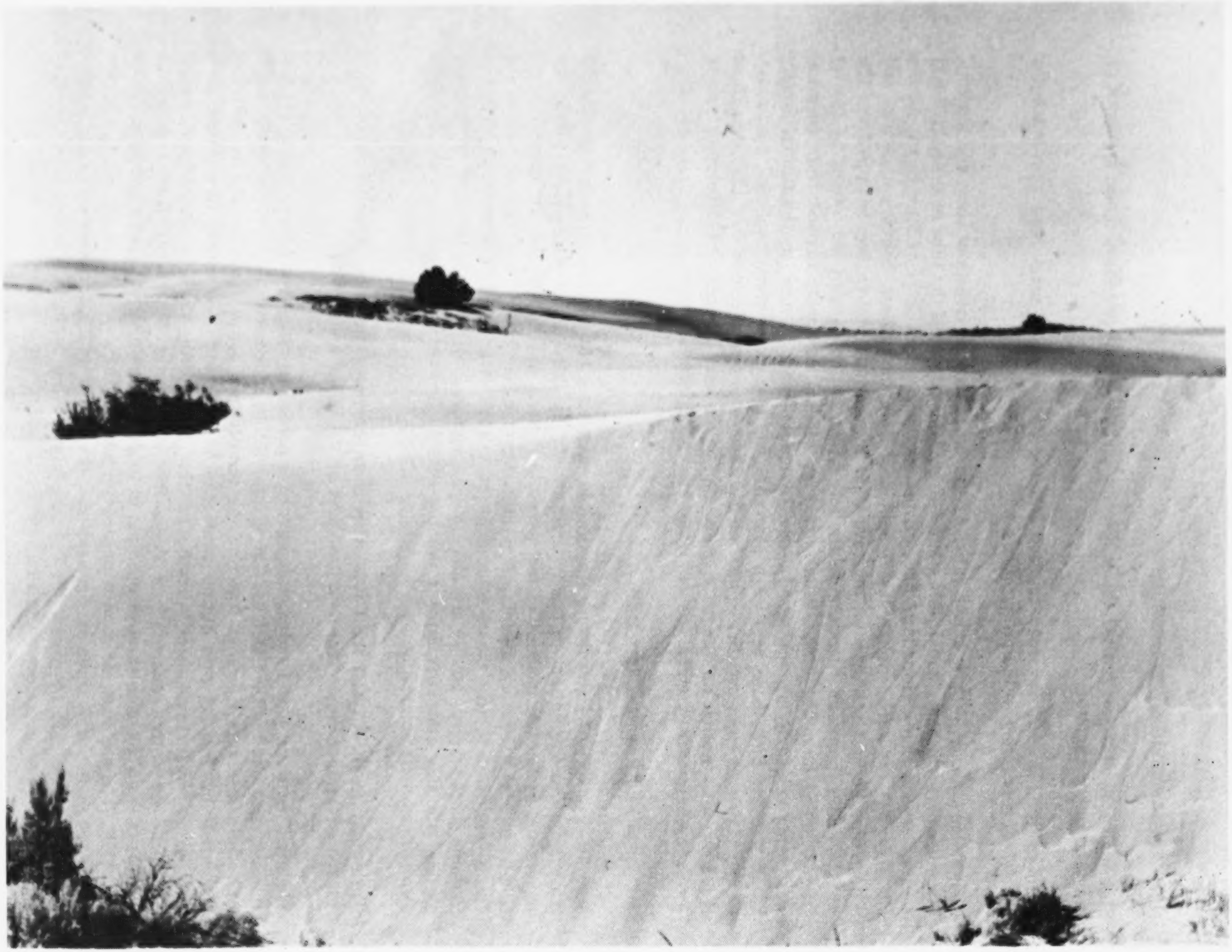


FIGURE 31
Idaho Sand Dunes near St. Anthony in eastern Idaho
(Idaho Department of Commerce and Development photo)

rose, desert globemallow, *Mentzelia, Oryzopsis* (Indian rice grass), *Penstemon, Phacelia, Phlox,* and Chokecherry.

Note lichens and mosses on lava outcrops.

22.4 Shearing pens. This area is used for late spring and early summer sheep range. Evidence of heavy grazing is common.

22.8 Turn right on graded dirt road to Civil Defense Cave. Follow main road and watch for official signs pointing to the proper roads.

27.6 Civil Defense Caves. This is a lava tube. As the outer part of lava flow cools and hardens, the inner part still being liquid, flows out. During later eruptions the tube may be filled and emptied several times. Horizontal lines on the cave walls show level of later flows. As the last flow left the tube, molten lava would drip from the ceilings, forming stalactites and stalagmites. Vertical markings on the cave walls show where molten lava has run down the walls. Curious "popcorn" deposits on the left wall near the opening are formed by spatter from dripping lava. They have been coated by calcium carbonate derived from chemical weathering of overlying rocks. The cave extends about ½ mile southwesterly. Rocky Mountain blue birds have been seen near entrance; also violet green swallows' mud nests. Guano is present from bats that spend the days in cracks near the mouth of the cave. There are algae and mosses on the cave walls, and some even stained the developing calcite formation permanently green. Ice and water are on the cave floor.

32.4 Return to Red Road and turn right.

37.7 Split Rock – one of many fissure eruptions in the area – but an extra large and spectacular one. Large fissure eruptions of this type are formed by extrusion of highly viscous lava. The large crack in the top is about 15 feet deep. As it starts to cool and solidify, more material is intruded from beneath, opening the crack. Ropy suface lava is seen on the face of the fissure eruption. It too shows movement of viscous lava. Observe how larger plants – currants, chokecherry, etc. – are able to gain enough protection in the cleft to flourish. During late May and early June a number of wild flowers can be found inside the split. Desert mosses are abundant.

48.1 Turn right to the Crystal Ice Caves. This is an ungraded dirt road. Vehicles should have adequate clearance. Some lava rock protusion occurs in the main route.

47.5 Waterfall Ice Cave. One hundred feet of rope is needed to reach lower levels. These are lava tubes formed like the Civil Defense Caves, but with an added attraction. North winter winds blow into the cave openings lowering the temperature below freezing. The temperature remains below freezing even during summer months. As moist air moves through the cave, the water vapor crystallizes directly to the solid form, creating spectacular 6-sided snowflake-like water crystals as large as one foot in diameter. Water crystals are best seen in the lower levels. Descent through openings in tube floors using ropes. Steps are carved in ice waterfalls, but are slick, so rope is needed for safety. The caves are slowly filling with ice, and through the years some passageways have been filled with ice; rubber boots are advised, as water on the cave floor near the opening may reach a depth of 6 inches during summer months. Round trip to lower levels takes about 3 hours, but is well worth the time.

Another ice cave called the Crystal Ice Caves is located ½ mile northeast of the parking lot at the crest of the hill. A large rock pile built by the Boy Scouts is above the opening. Here, too, a rope is needed, but the tube is larger and the ice walls and water crystals are even larger and more spectacular. Allow 2 hours round trip.

End of trip – return to Rexburg on the Red Road.

REXBURG TO WEST YELLOWSTONE

By Edmund J. Williams, Dept. of Geology, Ricks College and
Delbert W. Lindsay, Dept. of Biology, Ricks College.

The Yellowstone Park and Snake River Plains have a record of intense volcanism during Pliocene and Quaternary times in geologic history, starting about 2 million years ago. This area is referred to as the Yellowstone-Snake River province, with the most recent eruptions taking place at Craters of the Moon about 2,000 years ago. A feature that has attracted much attention and study is the Island Park Caldera, the world's largest. This caldera is an elliptical structure, 18 miles by 23 miles in diameter, that was formed by the collapse of a volcano with outside dimensions of almost 30 miles. The caldera basin has been filled with rhyolite, ash, and basalt flows from the Yellowstone area. Rhyolite domes are common on the caldera floor.

The main vegetation of the Snake River Plains is desert shrub-bunch grass at the present time. In the vicinity of the river and man's canal systems, irrigation provides water for intensive agriculture. Dry farming and sprinkler irrigation from wells are also practiced broadly. North of Ashton the main forest type is lodgepole pine, although some Douglas fir and a few other evergreen species are also present. Lodgepole pine tends to form thick growths of single age stand trees but Douglas fir forests can be variously aged. Upland meadows are common and produce a profusion of color from early summer until fall by a succession of native wild flowers. Bird life abounds in the thickets and forest as well as along the water courses. Deer are common as are elk in some areas. Moose are abundant in the Big Springs area and are often sighted from the highway. This area includes some of Idaho's best fishing and features rainbow trout and kokanee salmon.

The road log begins on the Snake River Plains, crosses the Island Park Caldera and ends at the edge of Yellowstone Park. It can be made by car or bus at any time of the year, but late spring to early fall is recommended. At Ashton the route splits. One takes a scenic loop including the Mesa Falls via highway 47 and the other follows U.S. 191-20 directly up the flank of the caldera. A full day is needed for this trip.

0.0 Rexburg, Idaho. Proceed north on U.S. 191-20.

1.0 Teton River. Begin watching for sparrow hawks on telephone wires. The leveled land is diked for flood irrigation.

4.0 Sugar City, Idaho.

4.7 Junction. Proceed straight ahead on U.S. 191-20.

5.0 Railroad overpass. The south rim of the Island Park Caldera is straight ahead on the skyline.

8.8 Historical site. Fort Henry was built by trappers in 1809 and was occupied for three consecutive winters by various parties. It was the first structure built by white men in this area.

10.0 Saw Mill. This mill was erected for the purpose of utilizing lodgepole pine from the Island Park area. The sole product of this mill is 2 x 4 studs. In this general area harvesting of lodgepole pine lags behind timber production. More mills of this kind would be desirable.

11.0 Entering St. Anthony, Idaho. Henrys Fork of the Snake River cuts through the town. A shallow canyon exhibits the basalt underlying the Snake River Plain.

12.0 Headquarters of the Targhee National Forest. Information and literature available.

12.8 A marshy area supports three kinds of blackbirds in addition to the common magpies and many other species. Cattails are dominant.

13.4 Henrys Fork of the Snake River. Stop to observe swallows.

19.3 Fall River. This stream originates in the high country of the southwest corner of Yellowstone Park. From this point to Ashton there are excellent opportunities for flower viewing and photography. Stop and walk through the sage brush areas in late May to early July.

22.4 Road cut by turnoff on left. A good problem in geology. Note that the sand has been covered with a glassy basalt flow on the right. The heat from the flow has baked the sand to a bright red color. The flow is covered by a light colored welded tuff, possibly from the Island Park Volcano 10 miles to the north.

25.7 City of Ashton. Junction: at this point the route splits into the Mesa Falls Scenic Loop (State Highway 47) and the shorter, faster U.S. 191-20. If U.S. 191-20 is taken, skip this section and resume following mile 55.9, alternate route from Ashton.

26.4 Ashton Ranger Station on the left. The core of the Teton Range to the east is Precambrian metamorphic and igneous rocks which date at about 2.3 billion years making them some of the oldest rocks on earth. However, the building of the range itself started only about 3 million years ago and has continued to the present, making them some of the youngest of the Rocky Mountain system. Most of the sculpturing of the range was done by ice during the Pleistocene Ice Ages.

The area between Ashton and the caldera is sprinkler-irrigated or dry farmed.

32.0 Cave Falls turnoff. If you wish to make a side trip into the southeast corner of Yellowstone Park, turn here. The road is gravel and extends for 14 miles. The falls is a beautiful sight extending across Falls River with a height of 30 feet. Beneath the falls is a beautiful natural cave.

33.4 Warm River Canyon, cut in basalt flows of Snake River Plain. Rim of Island Park Caldera on skyline straight ahead. The dominant trees are Douglas fir near the top, then aspen and finally lodgepole pine at the canyon bottom. Three kinds of native orchids occur in this canyon. Photograph but DO NOT collect these plants.

34.8 Warm River. Trout are protected immediately below the bridge. Stop and throw bread or other edibles into the current and watch the big ones strike. Closed to fishing. As you leave Warm River you are climbing up the southeast side of the Caldera. Notice the slope effect on the vegetational distribution. The south-facing slope of the canyon almost represents the true desert types (bunchgrass-desert shrub) but the north facing slope is solidly timbered. Why?

37.3 Scenic overlook. **Stop.** Good view of Warm River Canyon cut in basalt flows. Good view of Teton Range to the southeast. Rhyolite seen in road cuts. An immense Douglas fir is labeled. Study the cones. They are distinctive to the species. Coral root orchids occur in June in the lodgepole pine forest across the road from the overlook.

38.3 Bear Gulch Ski Area. Columnar jointing in basalt in road cut straight ahead.

39.9 Crest of southeast rim of Island Park Caldera. Lava flows have filled the caldera to an average elevation of 6,000 feet. Meadows along the roadside support a profusion of wild flowers. The large conspicuous white *Wyethia* displays a sunflower-like bloom in June. The flowers and young leaves are eaten by deer, elk and livestock and the roots were used by Indians for food.

40.6 Grand View turnoff, turn left. Lower Mesa Falls, height 46 feet. A good cross-section of the caldera floor showing basalt and rhyolite flows. The river falls over rhyolite, with basalt flows above. Jointing of the flow is seen in the canyon walls below the falls, and in the old stream channel to the left of the main falls. At times, during periods of high runoff, the old stream channel is occupied. Part of the south rim of the caldera is seen as the Snake River Butte on the left skyline.

Douglas fir is common on the canyon rim and on the lava-strewn slope to the river but most of the trees in view are lodgepole pine. Under the present forest service policy, scenic areas like this one are not logged although a large amount of timber exists in the area to be viewed. Some of the trees in this area are reddish, indicating that they have been sprayed in pine beetle control programs. Some of the lodgepole pine trees in the parking area are infested with mistletoe, a parasite that disfigures the tree with tight masses of branches called "witches brooms". This is a serious forest pest in this area.

Return to the road and turn left.

(See photograph of falls, figure 32.)

41.4 Upper Mesa Falls turnoff, turn left. Descent into the river gorge; about one mile on good road.

42.3 Park and walk to the brink of the falls, height 107 feet. Waterfall plunges over rhyolite flows. Notice on far side of canyon that the jointed rhyolite has been rounded and waterworn. This illustrates that waterfall retreat has occurred in the past. Judging from the jointing near the brink of the falls, it is still operating.

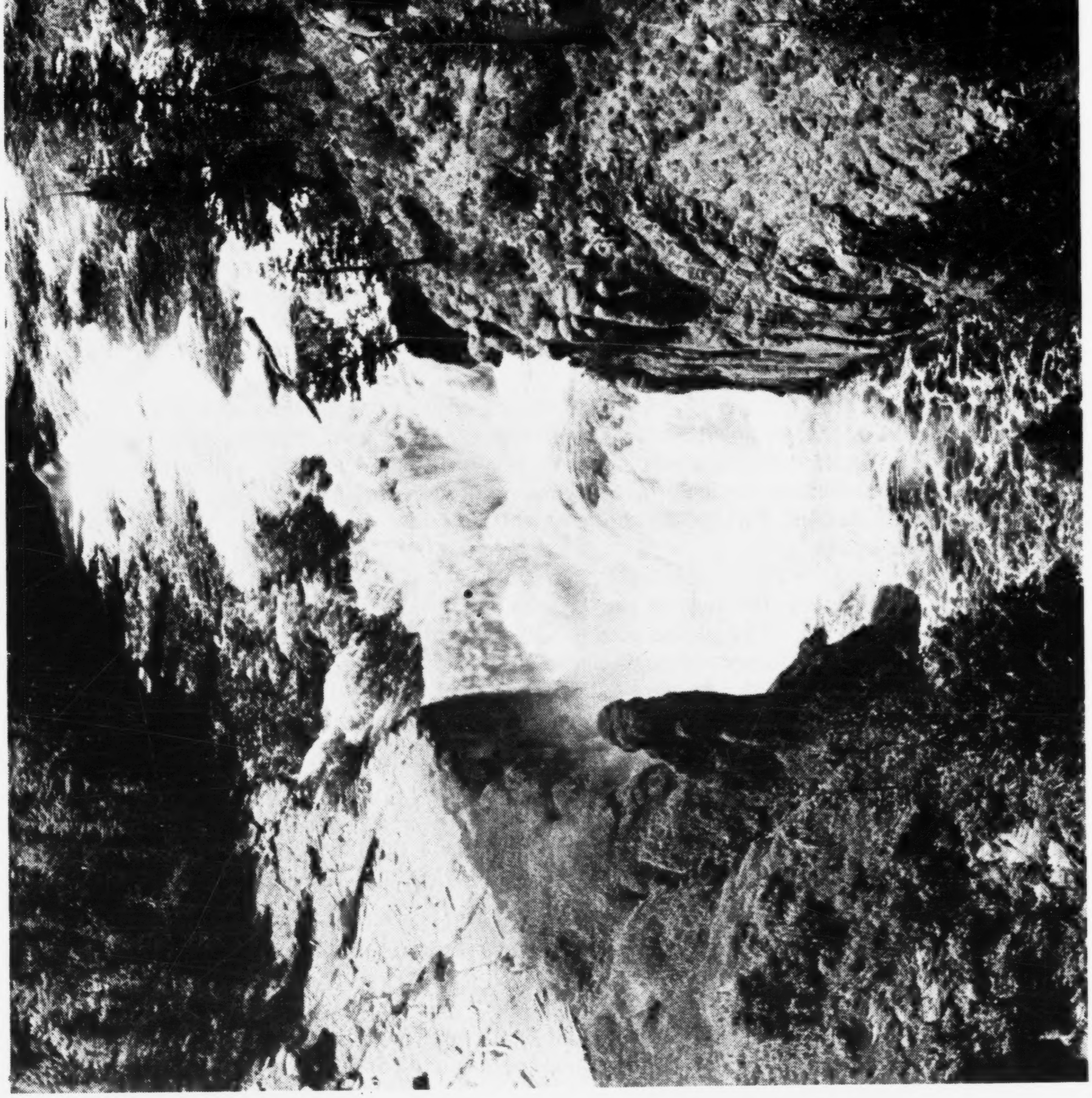


FIGURE 32
Lower Mesa Falls (Henrys Fork of the Snake River)
(Idaho Department of Commerce and Development photo)

Danger! This waterfall is on private land and trails are not well kept. There are no guard rails along the edge of the chasm. Groups of children should not be brought here unless they are well supervised.

Across the plunge basin are mosses and ferns that thrive in the spray zone. Some of the trees of the spray zone have been killed, possibly by freeze-thaw cycles. Ingenious fisherman find their way into the gorge where a profusion of bracken fern, thimble berries and other rank growing vegetation exists.

43.2 Main highway, turn left.

45.0 State Fish Hatchery Road; possible side trip of eight miles. The next few miles travel across the flat caldera floor. Note occasional basalt flow outcrops.

53.6 Osborne Spring picnic area. For the next few miles, consider the lodgepole pine forest. This species cannot reproduce in its own shade. Consequently, we find young trees only in cleared areas such as the road cut. Young evergreen in dense lodgepole pine stands represent other species.

55.4 Osborne Bridge Road, stay right.

55.9 Junction with U.S. Highway 191, turn right. Good view of north, west, and southwest rim of caldera. Note flat floor. Road log continues on page 168 after the following alternate route section.

If U.S. 191-20 is taken from Ashton, Idaho, to Island Park, use the following log.

25.7 City of Ashton, Idaho; keep straight ahead on U.S. 191-20.

27.0 The Three Tetons pulloff: to the east is the Teton Range. The rocks that make up the core of the Teton Range are Precambrian igneous and metamorphic. They date at about 2.3 billion years, making them some of the oldest on earth. However, compared with the rest of the Rocky Mountains, the range itself is quite young, with mountain building starting about 3 million years ago, and continuing to the present time. Most of the sculpturing of the Teton Range has been done by glaciers during the Pleistocene Ice Ages.

27.7 Henrys Fork of Snake River. Shallow canyon has been cut in basalt flows of the Snake River Plain. Straight ahead the road climbs the south flank of the Island Park Caldera. Note pumice, ash, tuff, and lava flows in road cuts.

28.5 Good outcrop. Stop on pulloff on right and walk across highway to road cut. The dark layer at the bottom is densely welded gray rhyolite tuff. The lighter layer above is unconsolidated bedded white tuff, sorted during airfall into quartz and feldspar crystals and pumice. The top layer is partially welded orange-pink rhyolite tuff. A good view of the Snake River Plains is seen to the south.

30.2 National Forest Boundary.

32.1 Crest of south rim. Road now leads down to the floor of the caldera.

32.8 Start of caldera floor. For the next few miles note the flat caldera floor. Occasional outcrops of basalt flows that filled the caldera are seen in roadcuts.

38.9 National Forest Plantation No. 5. Centennial Mountains and Continental Divide straight ahead. The Centennial Mountains are made up mostly of paleozoic sedimentary rocks. Forest plantations are rather common in Island Park. They represent attempts to aid nature in rapid recovery of logged over areas. Natural seeding is cheaper and sometimes more effective. Rodents, especially gophers, are pests in tree farms. They destroy roots and branches of young trees. Grazing must also be restricted in tree farm areas.

40.9 Swan Lake. Usually in the summer at least one pair of swans nest here in a place easily seen from the road.

42.1 Yellowstone lava flows on right skyline. These rhyolite flows have buried the east rim of the caldera. West rim is seen on left skyline.

0.0 New starting mileage at the junction of Mesa Falls Scenic Loop and U.S. 191-20. The next few miles show the tendency of lodgepole pine to form single aged stands. Watch for uniformly sized young trees along the road cuts.

1.6 Entering Last Chance Resort area. Observe profusion of *Wyethia* in meadows, and water birds along the river. Occasionally pelicans can be seen here.

4.6 Island Park Range Station. Information available here.

4.8 Buffalo River. Pond's Lodge Resort. Buffalo Forest Campground. Turn left immediately after crossing bridge. Dirt road leads to Island Park Dam, distance 2 miles.

6.7 Island Park Dam. The dam is built on the north rim of the caldera. East of the dam, the caldera rim is not well visualized due to the large amount of subsidence of this part of the volcano, and the fact that lava flows have buried most of what was left. The reservoir is outside the caldera. As summer progresses and water begins to warm up, green algae and plankton may be seen floating on the surface water; this is prime food for the kokanee salmon which thrive here along with rainbow trout and coho salmon.

Return to main highway at Pond's Lodge Resort. The Snake River provides excellent fishing from below the dam along the river to Osborne Bridge.

9.4 Main highway. Turn left.

11.0 Tree farm. Notice the dense shrubby growth compared with the almost bare forest floor beneath dense timber stands.

13.8 Mack's Inn Junction. Turn right on Highway 84 to Big Springs.

15.5 Straight ahead are seen Yellowstone rhyolite flows on skyline.

16.7 Moose Creek, properly named as moose can be seen here occasionally. In late August and September bright red spawning kokanee salmon are spectacular here.

18.5 Big Springs. **Stop.** One of the larger springs in this part of Idaho, with a flow of 186 second feet, the water has a constant temperature of 52 degrees F. It is the headwater source of Henrys Fork of the Snake River. Probably source of the water is the high Yellowstone country to the east. The spring area is surprisingly small considering its rate of water delivery.

Beneath and adjacent to the highway bridge, several hundred trout may be observed lying in the shallow crystal clear water. These rainbow trout reach up to 18 inches long and weigh approximately 6 pounds. They are hand fed by visitors and strictly protected. The yellow monkey flower, *Mimulus guttatus,* presents a brilliant floral display in mid-summer. Proceed across the bridge; follow main gravel road back to U.S. 191.

20.9 Henrys Lake outlet.

22.9 Island Park Lodge.

Possible side trip. Cross highway and take good road to top of Sawtelle Peak, elevation 9,901 feet. Distance 10 miles. Good view of caldera, Centennial Mountains, western Yellowstone Park and surrounding area. Also note the watershed rehabilitation project in Rock Basin, due west. Contouring, seeding, and proper placement of catch basins has helped repair the damage due to many years of overgrazing by sheep. Sawtelle Peak is a basaltic igneous intrusion. Rock contains abundant wellshaped dark green augite crystals. Trip highly recommended. Turn right on main highway.

23.1 Henrys Lake Flat. Terraces on hills surrounding open area indicate a shallow lake once existed here, probably formed during Pleistocene Ice Ages. Mountains straight ahead are Precambrian metamorphics. This area is one of the finest summer range areas in Idaho. It is used exclusively for cattle. *Wyethia* and sagebrush control projects have been used effectively to improve the range.

28.0 Henrys Lake on left.

29.6 Junction with Highway 87. Possible side trip to Madison Canyon Earthquake area. Round trip to West Yellowstone, 49 miles. See Madison Canyon Slide, fault scarps, and other features of the 1959 earthquake. Possible side trip to west to the Sherwood Museum located 3 miles from U.S. 191 will provide an insight into some of the history and early wildlife found in this area.

34.4 Howard Springs. Roadside stop. Drink from one of Idaho's best. Named for General Howard, who camped here during his pursuit of Chief Joseph; interpretive signs tell the story. This spot also shows the slope and exposure effect on vegetation. South-facing slopes are nearly desert in vegetational cover whereas north-facing slopes are densely forested. Bears can be found here occasionally.

35.0 Continental Divide. Targhee Pass, elevation 7,075 feet. Water falling east of this point drains via the Missouri-Mississippi River system to the Gulf of Mexico. Water falling west of this point drains to the Pacific Ocean via the Snake-Columbia River system. Outcrops at the pass are Paleozoic sedimentary rocks. Fossils are not common. The Gallatin Mountains to the northeast on the skyline are also Paleozoic sedimentary rocks, and are the only rocks of this kind and age in Yellowstone Park.

42.0 West Yellowstone, Montana.

The Island Park area is the birthplace of a major branch of the Snake River. Water is a major resource here, perhaps the most important. One need only climb from the desert floor of the Snake River Plain with its strict dependence upon irrigation into this area of springs, streamlets, and rivers to begin to appreciate the water production value of this area. During the summer, water from the Snake River is cycled from canals to farms and back to the river via the water table many times of its trip towards the Columbia River and the sea. Snake River water is one of Idaho's most valuable natural resources.

For more information, see:

Hamilton, Warren, 1965, Geology and Petrogenesis of the Island Park Caldera of rhyolite and basalt, Eastern Idaho. U. S. Geol. Survey Prof. Paper 504-C.

Reed, John C. 1963. Structures of Precambrian crystalline rocks in the northern part of Grant Teton National Park, Wyoming. U. S. Geol. Survey Prof. Paper 475-C.

REXBURG TO SALMON

By Edmund J. Williams, Dept. of Geology, Ricks College and
Delbert W. Lindsay, Dept. of Biology, Ricks College.

Driving Distance: 165 miles one way. Trip can be made by bus or car any time of year, although side trips cannot be made in winter or early spring.

This trip takes a full day. No special equipment is necessary.

0.0 Rexburg, Idaho. Travel west on Highway 88.

6.0 Henrys Fork of Snake River. Note Menan Buttes on left. These are two extinct volcanic cones that erupted about 10,000 years ago, making them some of the most recent volcanoes in Idaho. The north butte rises about 800 feet from the surrounding plain, and all cones are in a straight line indicating eruption along a fault or fissure. They are composed of glassy-olivine basalt tuff. There are a total of five cones, but only two can be seen from this point. Note fissure eruptions of Late Quaternary age for the next few miles.

This is an excellent place to contrast three kinds of ecosystems. The river banks are dominated by willows, dogwood, hawthorne, and other water-loving shrubs. A fringe of narrowleaf cottonwood trees occurs behind these in places. The desert proper with desert shrub-bunchgrass dominant is at places only a few feet from the water. Lichen encrusted lava is also prominent. Do not overlook the manmade ecosystems. Cultivated lands, fence rows and pastures are all different and can be studied at this point.

20.6 Sage Junction: keep straight ahead. Camas National Wildlife Refuge is 7 miles to the north on Interstate 15. The Camas National Wildlife Refuge (32 miles north of Idaho Falls on Interstate 15, just west of Hamer), lies along Camas Creek and consists of 4,000 acres of lakes, ponds, and marshland as well as sandhills, farm and meadowland. It was once a favorite hunting ground of the Blackfoot and other Indian tribes, and was a watering stop on the stage route from Salt Lake City to the mines near Virginia City, Montana. Parts of the road and way station are still visible.

The refuge is located between the Central and Pacific Flyways and the highest population of birds is during the spring and fall migrations, although there is a steady build up of nesting populations of waterfowl such as mallards and Canada Geese. It is easily accessible for bird watchers with roads bordering most of the lakes and marshlands, and along willow-lines Camas Creek. The present bird list contains over 160 species.

Besides the birds, pronghorn antelope are year-long residents; deer, elk, and moose occasionally visit. Other mammals of the area include bobcat, otter, mink, beaver, muskrat, weasel, badger, skunk, cottontail and jackrabbit. Contact Refuge Manager, Hamer, Idaho (phone 662-5425), for guided tour and descriptive literature and bird list.

Observe the desert vegetation for the next mile or so. In 1965, a brush fire destroyed most of the desert shrubs. In the next three years the grasses recovered more rapidly from the fire than the shrubs. Some of the new grasses are native but the crested wheatgrass found along the roads was planted by man.

22.7 Stop on crest of hill. The mountain range to the northwest is a southward extension of the Bitterroot Range, called the Beaverhead Mountains; it disappears to the south. The next mountain range that emerges southward from the Lemhi Range is the Lost River Range. These three mountain ranges are separated by narrow valleys, and trend in a northwesterly direction. Streams flowing from the valleys sink into the lava flows, hence the name, Lost River. The mountain blocks are bounded by faults making them horsts, and the valleys, grabens. The three ranges are made up of folded Paleozoic sedimentary rocks and have abundant marine fossils. The flat area to the southwest is part of the Columbia Plateau.

The valley straight ahead is the Mud Lake valley. Mud Lake can be seen to the right. This is a basin formed by faulting and folding, with Mud Lake occupying the lowest point. During the Pleistocene Ice Ages, the basin filled with water to a level of 200-300 feet higher than at present. The Lake has a history similar to that of Lake Bonneville of which the Great Salt Lake is a remnant. Mud Lake is not salty because water escapes underground to join other water at Thousand Springs near Twin Falls in southern Idaho. Most water for irrigation comes from wells in the Mud Lake valley. Water enters the lava flows at the base of the mountains to the north and flows southward to Thousand Springs. Another large Pleistocene lake occurred in the Roberts area to the southeast, and is called Market Lake. (Note crested wheatgrass as the prominent bunch-grass at the roadside.)

The Market Lake Wildlife Management Area north of Roberts in Jefferson County is under the Idaho Fish and Game Department and is one of the most accessible and interest provoking bird study areas in the western United States. A paved road that was formerly a through highway cuts directly across the marsh and throngs of waterfowl may be seen without leaving the car. As many as fifty different species have been seen in a two-hour period. (See bird list, page 175.)

1200 acres of marsh have been restored since the Fish and Game Department took over. The site is about 5 miles along and is entered from Interstate 15, half a mile north of Roberts.

This area is also a good example of a phenomena known as a perched watertable. The soil is underlain by clay beds lying in a basin which holds water from creeks from the mountains to the north. The impervious clays hold up the water and "perch" it, while outside the basin the main water table lies at great depths. The same situation exists in the Mud Lake region and in the Burley Lake Beds.

Contact the Resident Manager, Route One, Roberts (phone 228-3226), for arrangements for organized tours.

Roberts Slough, east of Roberts, is an oxbow lake cut off from the Snake River and is also an excellent place to view ruddy ducks, avocets, and other waterfowl.

25.8 Start of lake bottom of old Mud Lake. Sand and clay soil was deposited on lake floor during Pleistocene times. For the next several miles, the road travels across the flat floor of the extinct lake.

32.6 Terreton.

34.5 Mud Lake. Possible side trip to North Lake Wildlife Management Area. This area consists of over 8,600 acres of land and water surrounding Mud Lake. Its primary function is to attract, produce and hold waterfowl, but pheasants, sage grouse, deer, antelope, and rabbits are also benefited. Contact Resident Manager at Terreton (phone 663-5760) for more information.

35.6 Junction: take Highway 28 and keep right. This is the longest straight stretch of highway in Idaho. Watch for antelope for the next 30 miles.

41.6 Atomic Energy Commission boundary. The A.E.C. extends southward for about 40 miles. Buildings for housing nuclear reactors and other test equipment can be seen on the right. This is the approximate western limit of old Mud Lake.

51.0 Junction with Highway 22; keep straight ahead.

53.9 A.E.C. Boundary. "Reno Point" on the right. Note large alluvial fans at foot of Lemhi Range on left. Rattlesnakes are common on "Reno Point." Have you seen an antelope yet?

55.3 Note dark colored hill on right. This is part of a basalt flow that flowed this way when the canyon was at the same level as the valley to the south. Other outcrops will be seen later on that probably belong to the same flow. Most of the flow has been removed by erosion except what is seen here.

60.6 Note the alluvial fans at the base of the mountain on the right. They have been truncated at the toe by Birch Creek since they were built. The terraces formed by cutting the toe of the fans will from here on be called alluvial terraces.

64.5 Historical Site. Pre-historic man lived in this area at least 10,000 years ago. Within this valley, 136 archeological sites have been recorded. Of this total, 54 are open campsites, 77 are rock shelters and one is tipi ring site. Many of the rock shelters are on the right near Blue Dome.*

65.9 Blue Dome.

67.6 Chief Joseph and his band of Nez Perce ambushed a freight wagon and massacred all the people on it in 1877 at this site.

69.4 Lone Pine. Note basalt flows on the right.

73.1 Birch Creek.

79.0 Nicholia Mine. Possible side trip. Remnants of smelter and some old mine buildings may be seen 3 miles up the road on the right. Lead, zinc, and silver were produced in this area near the turn of the Century.

82.4 Charcoal Kilns. Possible side trip 6 miles to the west. When the Nicholia Mine and others near Gilmore were operating, charcoal was used for smelting of ore. Charcoal was manufactured near this point.

85.5 Killing sagebrush by spraying. This technique is intended to give the grass an opportunity to occupy the range. What might be the disadvantages of such practice?

89.0 Reseeding project. The desert shrubs have been removed. Might the removal have been due to fire, or was it done purposely to improve the range? What evidence supports your conclusion?

93.1 Gilmore Pass, elevation 7,186 feet. At this point the valley graben has been filled with sediments with a total thickness of about 9,000 feet. The highway now starts down into the Lemhi River valley, also a graben.

94.4 Gilmore Road. Turn left.

95.9 Gilmore Ghost town. This is the center of what is called the Texas mining district. The principal production in the area was from 1902 to 1929 with minerals of a total value of $35,000,000 being mined. The principal ores of the Gilmore area are lead and silver. Several mines are being re-opened at the present time.

Turn left at General Store and keep on main road to Meadow Lake. Watch for Douglas fir, the dominant forest tree, and mountain mahogany, a shrub of dry rocky hillsides.

100.0 Meadow Lake. This is an area which was occupied by a glacier during the Pleistocene Ice Ages. Meadow Lake is a moraine lake, with lateral moraines extending down canyon on both sides. A horseshoe-shaped terminal moraine is seen at the mouth of the canyon near the main valley floor just north of Gilmore. Rocks here are of the Precambrian Belt Series, and consist mainly of white quartzite. Several glacial cirques are located at the head of the glaciated valley. Excellent wild flower display.

*For more information on this subject, see **Birch Creek Papers No. 1**, an archaeological reconnaissance in the Birch Creek Valley of Eastern Idaho. Occasion Papers of the Idaho State University Museum, Number 13, by Earl H. Swanson, Jr., and A. L. Bryan.

Return to Highway 28.

105.8 Main highway; turn left.

119.0 Note fault at base of mountain straight ahead. Large block letter "L" on mountain straight ahead is on a triangular face called a "flatiron." Flatirons are common along faults separating a horst (mountain) from a graben (valley), and are caused by truncation of mountain ridges by a fault.

121.0 Leadore. Note for next several miles flat valley floor, with truncated alluvial terraces on both sides. Renewed downcutting by river after the alluvial slopes were built has formed the present valley. It is obvious that the rather small Lemhi River has not cut the valley but was probably much larger during the Pleistocene Ice Ages.

133.0 Lemhi River Biotic Communities:

Irrigated pasture – very valuable as pasture. The productive potential of these meadows is very high compared to desert pasture.

Narrowleaf cottonwood – typical river bottom type of central and eastern Idaho.

Stream communities.

Desert bunchgrass on valley sides produces some spring and early summer range.

Coniferous forests begin low on hillsides. Locally the Douglas fir gives way to alpine fir and lodgepole pine at higher altitudes.

Excellent bird study area. Each of the community types favor different kinds of species.

138.8 Challis volcanics are exposed on both sides of the road. These igneous rocks were deposited over this area during early Tertiary times. They consist of a thick layer of generally light colored rocks, and are seen as lava flows, breccia, and tuff.

140.0 Lemhi River Fish Weir and holding ponds. Salmon and steelhead counts are taken here. Spawners are also processed for eggs.

141.0 Note darkened bentonite and other Challis volcanics on left.

146.0 Tendoy.

148.3 Fort Lemhi. Good rest area. Turn right ½ mile. This is the first settlement in Idaho. Founded in 1855, it lasted until 1858 when it was abandoned due to Indian uprisings and crop failure. Mud walls of the old Mormon Fort can still be seen. The first irrigation in the northwest was practiced in this valley at that time.

Return to the main road.

149.5 Main road; turn right.

150.0 45th Parallel. You are now half way between the equator and the north pole.

152.0 Historical Site: Lewis and Clark expedition first contacted waters flowing to the Pacific Ocean. Birthplace of Sacajawea is also near this point.

159.0 Note layered Tertiary lake deposits in river terraces on each side of the valley. These bentonitic shales were deposited in the Salmon Basin during Miocene times and belong to the Carmon formation. The Salmon basin directly ahead (graben) has been formed by this time in geologic history, and the lake and near-shore sediments were deposited under these conditions. A near-shore plant fossil locality will be visited near Salmon.

165.0 Salmon.

Turn right on North Saint Charles Street (two streets before crossing Salmon River.) Keep on main road past power station, and ascend hill to the city dump. Keep right on main road. After rounding horseshoe bend, take small side road to the right. Keep right, proceed northward on main road for ½ mile. At any point along this road, walk to west along stream gullies for ¼ mile; fossil plants are found in layers of light colored bedded tuff. Fossils include redwood, cattail, fossil blossoms, horsetail, grass, insects, oak, fern, and maple.

Danger! Ledges and steep slopes: use caution! Those collecting fossils at this and any locality must keep in mind that this is a depletable natural resource. Take only what will be used for a scientific collection, preferably for a school.

An interesting tour of the mill or woods of the Intermountain Lumber Company can be made in this area if arrangements are made in advance by contacting The Manager, Box 1208, Salmon, phone 756-2788. (See study trip guides.)

For additional information regarding the Salmon area, see The Idaho Bureau of Mines Pamphlet 106, Geology and Mineral Resources of the Salmon Quadrangle, Lemhi County, by A. L. Anderson.

BIRDS THAT MIGHT BE SEEN AT MARKET LAKE (ROBERTS) IDAHO

Late April – Early May

GREBES – SMALL "DUCK-LIKE" BIRDS LOW IN THE WATER

Eared Grebe
pointed bill slightly upturned; buffy "ears"; black neck
Pie-billed Grebe
rounded bill; under tail feathers white; body brown; (summer black bill ring)

LARGE LONG-LEGGED OR LARGER WADING AND SHORE BIRDS

Great Blue Heron
About four feet tall; in flight neck folded; red crown dark crest on light colored head.
Sand Hill Crane
About four feet tall; in flight neck extended; red crown; tail feathers tufted.
Snowy Egret
Smaller white bird; yellow feet; (breeding season recurved plumes). The Common Egret is larger and has a yellow bill.

- Black-Crowned Night Heron
    - Short-billed; short-legged; short-necked; breast white; black crown: Usually active only in the early morning or evening
- American Bittern
    - Stocky; brown; black neck; bill usually pointed up
- Least Bittern
    - Small roving-sized; buffy-winged; black crown
- White-Faced Ibis
    - Very dark glossy beak turned down (decurved)

DUCK AND GOOSE-LIKE SWIMMING BIRDS

- Whistling Swan
    - Large white; duck-like; yellow spot in front of eye
- Canada Goose
    - Large; grey; dark head; black cheek patch
- Snow Goose
    - Smaller than Canada Goose; white with black wing tips

SURFACE FEEDING DUCKS, JUMP DIRECTLY IN THE AIR WHEN FRIGHTENED

- Mallard
    - Male, glossy green head; narrow white collar
- American Widgeon (Baldpate)
    - White spot on top of head; green stripe on head; blue bill
- Pintail
    - White strip extending up into brown colored head; tail feathers come to sharp point
- Green-winged Teal
    - Small duck; wide green band on side of head; vertical white stripe in front of wings.
- Blue-winged Teal
    - Small duck; white faced crescent
- Cinnamon Teal
    - Small duck; head and body rusty red color
- Shoveler
    - Wide bill; green head; white breast; chestnut sides
- Wood Duck
    - Small brightly colored; green crested head; red bill and eyes; chestnut breast

DIVING DUCKS: THESE DUCKS TAXI BEFORE TAKING OFF

- Redhead
    - Rusty head; body white; head sloping profile
- Canvasback
    - Rusty head; body grey; head round in profile
- Greater Scaup
    - Uncommon during this season; Blue bill, dark round head has green gloss
- Lesser Scaup
    - Blue bill; dark head purple gloss; female with white patch at base of bill
- Common Golden Eye
    - Round white spot in front of eye; green gloss to head
- Barrow's Goldeneye
    - White crescent in front of eye; purple gloss to head

Bufflehead
Small; mostly white; black back; white patch from eye to back of head
Ruddy Duck
Small; rusty red; white cheek; "spike" like tail often held verticle while swimming
American Coot (Mud Hen)
Slate grey with white pointed bill

HAWK AND HAWK-LIKE BIRDS

Red-tailed Hawk
Large (Buteo) broad winged; round tailed hawk; upper tail feathers red.
American Rough-legged Hawk
Large (Buteo) broad winged; light undersurface with black belly and black "wrists".
Marsh Hawk
Most common hawk of the refuge; white spot on top of rump
Sparrow Hawk
Smallest of hawks; reddish back and tail; long pointed wings

SMALL SHORE BIRDS

Killdeer
Noisy; a loud insistent **kill deeah**; two black breast bands; Display golden-red rump in flight and white wing stripe
Common Snipe (Wilsons)
Brown with striped back; extremely long slender bill; When flushed it makes off in a zig-zag and shows short orange tail
Long-Billed Curlew
Larger brown birds; long down curved bill (up to seven inches long); bright cinnamon wing linings
Willet
Flashy black and white wing pattern; large grey and white bird; bluish grey legs
Greater Yellowlegs
Large and slim. Bright yellowlegs; dark winged in flight with whitish rump and tail.
American Avocet
Head and neck pinkish-tan; upturned bill; large
California Gull
Grey mantles; black wing tips; red or red and black spot on lower mandible of bill; black tip on wing cut straight across.
Ring-Billed Gull
Smaller than California; complete black ring on bill; more yellow-green legs.

MISCELLANEOUS NON-SHORE BIRDS

Mourning Dove
Small brown pigeon-like bird; pointed tail which shows white spot when it flies.
Ring-necked Pheasant
Large chicken-like bird; long sweeping pointed tail; highly colored with a white neck-ring.
Great Horned Owl
Only large owl with ear-tufts; heavy barred beneath; white throat collar.
Belted Kingfisher
Big headed and big billed; blue grey above, white below; ragged bushy crest and broad grey breastband

Common Nighthawk
In flight it has erratic wing strokes; broad white bar on wing and very pointed.

Red-shafted Flicker
Shows red under wing and tail in deeply undulating flight; wide black crescent across chest; brown back

Horned Lark
Brown ground bird; two small black horns; black shield below the white throat. Walks, does not hop; erratic flight close to ground.

Cliff Swallow
Rusty or buffy rump; square-tailed with dark throat patch.

Barn Swallow
True swallow tail; blue black above and cinnamon-buff below

Long-billed Marsh Wren
Brown with conspicuous white line over eye; black and white stripes on back; dark overall color.

Loggerhead Shrike
Big-headed and slim tailed; grey above, white below with conspicuous black mask on face; taking flight it drops low.

Starling
Black in overall color; triangular look in flight; purple and green gloss in spring.

Western Meadowlark
Chunky brown bird with yellow breast and a V of black;walking, it nervously flicks tail open and shut to show white on each side of the tail.

Yellow-headed Blackbird
Black bird of robin size; orange-yellow head and breast; conspicuous white wing patch in flight.

Redwing Blackbird
Black; red shoulder patches; yellow margin; females brownish and sparrow like.

Brewers Blackbird
All black with white eyes; purplish reflections on head and green on body in flight.Brown-headed Cowbird
Small black bird with brown head; female uniformly gray.

HAWKINS BASIN FIELD TRIP

By Department of Geology, Idaho State University, Pocatello, Idaho

0.0 Leave intersection of 8th Avenue and East Lovejoy in Pocatello and head south.

0.2 Turn right at foot of Red Hill.

0.4 Stop. Turn left on 5th Avenue (Highways 30N, 191, 91).

1.4 Turn sharp right onto Fredregill Road.

1.6 Stop. Turn left on South 2nd Avenue.

2.2 **STOP NO. 1**

Disembark and cross road to outcrop on left of basaltic lave flows; this is near the north end of the Portneuf Valley flow system. Evidence indicates that the flows moved down the valley some 26,000 B.P. (before present). The basalt boulders were smoothed by water action during the draining of Lake Bonneville through the Portneuf Valley.

2.7 Alluvial cones at base of basaltic valley wall on left and the mass wasting of basalt along this valley wall as indicated by talus slopes. Adjacent to the road on the left are scars of earlier meanders of the Portneuf River.

3.2 The valley of the Portneuf River on the right. The lower part of the west valley wall has been tentatively mapped as the Salt Lake Formation.

3.7 Stop. Cross Union Pacific RR tracks and Portneuf River.

3.9 The upper part of the west valley wall has been eroded into rocks deposited during the Cambrian Period some 500 million years ago.

4.1 Stop. Turn left on Mink Creek Road.

4.9 Coarse and well-rounded alluvial gravels in road cut on right.

5.3 Basaltic flows across the valley to the left capped by alluvial sediments which, in places, have been washed over the edge of the flow as discontinuous alluvial cones. Below the base of the alluvial cones there is exposed the upper part of an earlier, lower lava flow.

6.1 Cutbank in loess in right-hand road cut.

6.2 **STOP NO. 2**

Disembark; Portneuf Gap toward the east. This has been excavated by the river through Cambrian sedimentary and meta-sedimentary rocks. The position of this gap might mark the trace of a fault plane which transects a known fault extending along the east side of the Portneuf Valley through Pocatello. The basaltic lava flows, which once were continuous through the gap, have been eroded from it by flood waters from the overflow of Pleistocene Lake Bonneville. On the right side of the gap about four-fifths of the way up the valley wall there is displacement of the Cambrian beds indicating fault slippage in which the block toward the south was dropped down about 25 feet relative to that on the north.

Note the alluvial terrace along the east side of Mink Creek; alluvial fans have been deposited on the top of this terrace, one of which shows below an old house just about south of this point at the foot of the east valley wall of Mink Creek. Slightly west of south, just below the skyline can be seen the complex folded Cambrian strata which underlie Slate Mountain. The road continued on the high terrace along the west side of the valley of Mink Creek.

6.6 Immediately eastward across the valley is the alluvial fan formed at the mouth of a small tributary to Mink Creek, as was mentioned at STOP NO. 2.

7.0 Shallow, concave depression in the east wall of the valley indicates slump, as does the hummocky surface at its base.

7.2 Good exposure of loess in cutbanks on the right side of the roadway.

8.0 Outcrops of the Cambrian Ute Limestone which forms the east wall of the valley of Mink Creek at this point. The beds dip about 20 degrees toward the east. This limestone is one of the more fossiliferous beds in the Pocatello area; collected from it have been fossil trilobites, algae, and brachiopods.

9.0 Note the sharp change in the direction and angle of dip of the beds on the valley wall to the left.

9.2 Outcrops of loess. The road cuts on the left side of the road are mantled with colluvial materials.

9.3 **STOP NO. 3**

Disembark; just inside the boundary of Caribou National Forest marked by the cattle guard. Note in the undercut banks on the west side of Mink Creek that the loess stands in vertical or near-vertical cutbanks, this being one of its characteristic features. The gravel seams in the loess are pebbles washed down from the hillsides above during heavy rains which occurred during the time of deposition of the loess.

The outcrop of the Cambrian Ute Limestone at the mouth of Kinney Creek is one of the favored localities for collecting the pygidia of trilobites.

9.8 The age of the Mink Creek valley at this point is probably early maturity, as indicated by the relatively narrow floodplain, the meandering course of the stream, and the nearly V-shaped transverse profile of the valley.

10.5 Scree slopes are well exposed in lower part of the west valley wall. The blocks were weathered by frost action from outcrops higher up the valley wall and were caused to fall into their present position by gravity.

11.1 An outcrop of argillite beds in the Cambrian Brigham Formation in the roadcut on the left.

11.5 Another good example of a talus or scree slope along the base of the west valley wall. The rock in this slope is quartzite.

12.6 **STOP NO. 4**

An outcrop in the roadcut just south of the stop is of Cambrian argillite, a somewhat metamorphosed shale. Ripple marks are well displayed on one of the bedding planes. Note that the outcrop is cut by transecting joint sets.

13.0 The transverse profile of the valley is a V-shaped one there being no floodplain apparent in this younger headward part of Mink Creek Valley.

13.8 Road cut on the right shows red soil produced by the weathering of iron-rich red beds of Cambrian age.

14.1 Along the cut on the right side of the road are cobbles of light-gray volcanic ash which have been moved downhill from an outcrop of the same material higher on the valley wall.

15.0 Excellent exposure of loess cutbanks on both sides of the road.

15.4 Entering Power County, leaving Caribou National Forest.

16.1 Note general accordance of the summit levels of the hills in the near horizon toward the southeast. This represents an old baselevel since dissected by the streams draining the area.

16.7 Scout Mountain shows on the skyline to east of this point. The crest of Scout Mountain is an outcrop of Precambrian rocks whereas the bulk of the mountain has been carved out of rocks of Cambrian age. An eastward-trending fault cuts across the axis of Scout Mountain.

17.7 SLOW – Southwest of this point is the Deer Creek Range. The top of Bannock Peak barely shows at the north end of the range. The high peak in the middle of the range (farther toward the south) is Deer Creek Peak which reaches an altitude of 8,670 feet. The level of the divide (at 7000 feet altitude) which marks the crest of the range is uniform from the north end of the range to its south end; this probably is an ancient peneplain which subsequently has been dissected by many more recent cycles of fluvial erosion. Further study may indicate that the crests of the high peaks of the range, such as Bannock and Deer Creek, might be monadnocks.

The broad Arbon Valley Basin lies between Deer Creek Range on the west and Bannock Range on the east. Pending further mapping, such basins as this probably should be interpreted as structural basins as are developed in the typical Basin-and-range Province of southern Idaho, Utah and Nevada. Basins such as this, which open southward into the Great Salt Lake Basin, may have contained arms of the Pleistocene Lake Bonneville.

21.0 Good exposure of loess in the cut on the left side of the roadway in which there is a paleosol (old soil) exposed; this is the streak of dark brown material near the top of the cut.

21.5 A half-mile toward the west is a deposit of the Salt Lake Formation in which the beds show a dip angle of about 15 degrees toward the northeast. Note that above the cut the farmer has cultivated his hill without regard to contour lines. The furrows will serve only to concentrate runoff and will greatly increase the rate of which the topsoil is being eroded.

22.8 Turn toward the southeast on metalled county road. This lies in the drainage of the westward-flowing Rattlesnake Creek.

24.5 Note outcrops of Salt Lake Formation in brush-covered splotches on hillside toward the left. The soil between these bedrock outcrops is under cultivation. This same phenomenon shows in the fields toward the southeast through thin soil cover indicated by the light-gray splotches.

24.9 The floor of the valley on the right exhibits an alluvial terrace level which is now undergoing dissection because of a minor lowering of the base level of Rattlesnake Creek.

25.7 The crescent-shaped scar on the terrace toward the south appears to be the slip face of an old slump block.

26.5 The floodplain of Rattlesnake Creek is well exhibited south of the roadway and two or more terraces, now somewhat dissected, can be seen on the south valley wall.

26.8 Toward the left (west) of the road are outcrops of very light gray volcanic ash. The ash may have been exploded into the atmosphere from once-active volcanoes in the near vicinity. The ash fall exposed here is probably somewhat older than those beds resultant from the explosion of Mount Mazama (Crater Lake, Oregon) some 7500 years B.C.

The outcrop immediately ahead is that of a limestone of Cambrian age. The rounded surface indicates erosion by flowing of water.

27.0 SLOW – on the left side of the road, particularly well exposed, is an outcrop of brecciated rock as is characteristic of fault planes. The bedrock west of this brecciated rock is Cambrian limestone whereas that immediately east of it is Cambrian quartzite. In all likelihood, the fault will be found to exhibit downthrow on its west side.

27.5 **STOP NO. 5**

Disembark; the exposure in the roadcut on the north side of the road shows clayey ash at the base overlain by a very coarse alluvial gravel which is in turn overlain by an impure clayey volcanic ash. The contact between the gravel bed and the overlying impure ash is a very sharp one in contrast to the lower contact of the gravel lens which blends into the underlying alluvial materials. A bench has been excavated in the upper part of the ash bed and exposed above it is an outcrop of loess.

27.8 On the south wall of Rattlesnake Creek are two well-displayed alluvial terraces. The lower one is that on which the farm home is built, and the upper one lies about 40 feet above it.

30.6 **STOP NO. 6**

Disembark; divide between the Rattlesnake Creek watershed and that of Hawkins Creek. Hawkins Basin lies toward the southeast.

30.7 SLOW – Southeastward from this point, just above the floor of Hawkins Basin, are exposures of very light gray material which probably is volcanic ash. Hawkins Reservoir can be seen farther southeastward in the Basin. The east and north walls of the basin are formed of rocks of Cambrian age and the west wall of the basin is composed of rocks of Paleozoic age not differentiated specifically as to system. The south wall of the basin is formed by silicic volcanic rocks of Tertiary age.

Detailed field investigation might reveal that a volcanic vent in the mass of Tertiary silicic volcanics might have supplied the volcanic ash observed at many places in this vicinity; however, it has been suggested that once-active volcanoes in the vicinity of Malad were the source of the volcanic ash.

Eastward from the Hawkins Reservoir, Hawkins Creek cuts through the Bannock Range through a water gap.

Such a basin as this would provide the field research necessary for a very interesting Master's thesis on geomorphic geology.

31.2 The roadway lies close to the crest of the interfluve separating Hawkins Creek drainage from Garden Creek drainage.

32.3 STOP BUT DO NOT DISEMBARK – several terraces are very well displayed on the south wall of Hawkins Basin. Three miles or so to the north of this point can be seen the west flank of Tom Mountain and, some three miles farther north, Scout Mountain. About one-third of the way up the West flank of Tom Mountain is a mass of gray rock which may be of biothermal origin. The verticality of the beds from which Scout Mountain has been carved is easily apparent from this vantage point.

32.8 The roadcut on the left exposes a bed of volcanic ash. The drainage on the north is that of Garden Creek which cuts through the Bannock Range through Garden Creek Gap, another water gap.

33.3 Below, in the basin floor, can be seen white splotches in the cultivated field, these are exposures of volcanic ash showing through thin mantle.

Immediately east of this exposure on the wall of the basin, are outcrops of silicic volcanic rocks; these same rocks outcrop on the right side of the road along the divide on which we are now riding.

34.6 **STOP NO. 7**

Disembark; entering Garden Creek Gap. The rock exposed here is much-jointed quartzite of Cambrian age. A talus slope has been developed along the left-hand side of the road.

Outcrop of phyllite on the north side of the road, the age of which has not yet been determined.

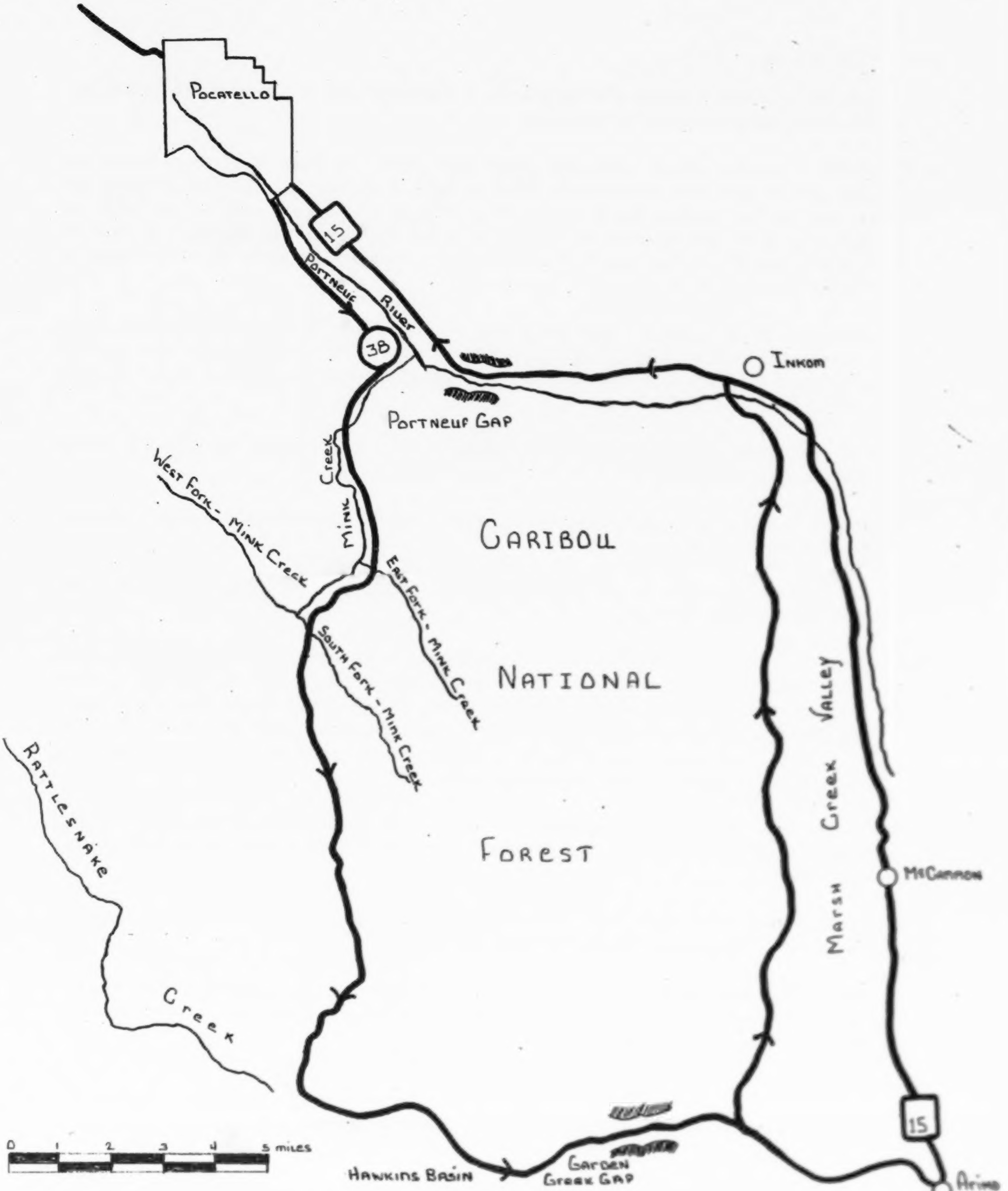

Pocatello
15
Portneuf River
38
Portneuf Gap
Inkom
Caribou National Forest
Mink Creek
West Fork - Mink Creek
East Fork - Mink Creek
South Fork - Mink Creek
Rattlesnake Creek
Marsh Creek Valley
McCammon
15
Arimo
Hawkins Basin
Garden Creek Gap
0 1 2 3 4 5 miles

FIGURE 33

Hawkins Basin Field Trip

This is a good point at which to take a picture of the water gap Garden Creek has cut through the Bannock Range and will illustrate the very steep-walled water-cut valley that has been created. The fact that the course of Garden Creek through the gap is a strongly curved one suggests that it is a superposed stream.

Walk down the road and examine the outcrop of quartzite.

35.5 Emerging from Garden Creek Gap into the Marsh Creek Basin. This, too, is probably a structural basin which subsequently has been partly filled with alluvial and colluvial sediments.

36.0 The road is descending a bajada-like slope toward the axis of the valley. The mountain range bordering the east side of the valley is the Portneuf Range.

36.7 Sharp turn toward the north (left). Road now follows for a short distance a high terrace in the valley of Marsh Creek.

The Portneuf River cuts through the range in the low gap visible along the eastern skyline. Flows of basaltic lava, which are thought to have welled up from fissures in the vicinity of Bancroft, came through this gap and spread into the Marsh Creek Basin. However, these basaltic flows moved southward only to a point three miles south of McCammon but flowed northward along the valley of Marsh Creek and of the Portneuf River as far as Pocatello.

39.8 Cutbanks on the right side of the road show the alluvium of the high terrace from which we have just descended.

40.9 Sharp turn to the left. The road has now descended to a still lower terrace level.

41.2 Cutbank a mile to the east shows alluvial sediments overlain by a thin layer of basaltic lava.

41.5 STOP BUT DO NOT DISEMBARK – Marsh Creek Floodplain is nicely exhibited in the valley to the north and the meandering course of the creek across the flood plain is well displayed. The right-of-way of the old Utah and Northern RR can be seen as a trace along the east side of the floodplain. A remnant of a terrace can be seen just below the road level. A higher terrace level, the one on which we rode earlier, shows straight ahead.

42.9 Roadcut on the left exposes the alluvium of a cone formed by a small tributary entering Marsh Creek Valley from the west. This is but one of a great number of similar features to be observed all along this side of the valley.

43.6 Outcrops of basalt show well down the middle of the valley. The basalt occurs in several flows readily distinguishable one from another.

44.3 The road is cut across another alluvial cone. The coarse gravels show in the cuts on both sides of the roadway.

45.4 STOP NO. 8

Disembark; an alluvial cone has been built here at the mouth of the tributary valley entering the main valley from the west. Note the very large boulders that have been moved by the torrential flood of water during heavy spring rains. The smaller particles are round in form and thus indicate water erosion as they were transported down this tributary valley. The smoothed surfaces of the larger boulders are indicative, too, of the erosive effect of flowing water. The sizes of the boulders and cobbles decrease away from the mouth of the valley.

Headward erosion of the gully along the south side of the road entering from the east is threatening the existence of the road we are on. Further erosion will cause the gully to cut through the road unless remedial work is undertaken by the highway department to protect the roadway.

46.3 Gullying into the margin of the high alluvial terrace is well displayed along the west side of the roadway. The gully on the north side of the alluvial cone appears to have been excavated during the spring floods of 1963; note the very steep walls of this gully.

46.8 One of the very largest of the torrent deposits of cobbles and boulders. The finer sediments of the alluvial fan built before the current came down the two tributary valleys was stripped away by the flood of waters.

48.9 Marsh Creek (to the east) is meandering so widely that it may soon cut off some of its meander loops.

49.4 The edge of the basalt flow east of us indicates erosion by a flood of water pouring across the top of the basalt. The hummocky ridges this side of the flows are composed of rubble eroded from the basalt by the cascading waters. The type of topography shown here and on the surface of the lava flow is that which is so well displayed in central Washington and has been named "Scabland."

50.3 The edge of the basalt flow straight ahead shows talus blocks which were frost weathered from the columns of the flow.

51.5 Note erosional remnant of Cambrian quartzite which has been surrounded by a deposit of alluvium. The dip of the beds is about 30 degrees toward the east; possible fault on the west face of the remnant.

52.1 The valley wall to the left is suggestive of earth slump as may be interpreted from the slip face and the hummocky topography of the slump mass below that.

52.5 The lava flow toward the east shows columnar structure very well; there are obviously two distinct flows. Note at the base of the lava the large blocks of basalt which may have been eroded from the flow by stream action.

53.1 Outcropping in the hillside directly ahead is a bed of light-gray volcanic ash.

54.2 Northeast of this point is a kipuka of Cambrian limestone. Originally the mass of limestone was surrounded by the basaltic lava flows which subsequently were eroded away from its west and east sides. The west face of the limestone hill may be a fault scarp.

54.6 STOP BUT DO NOT DISEMBARK – The outcrop on the left-hand side of the road is of the same limestone as that seen out in the valley. Note the presence of the fault plane cutting this outcrop and the offsetting of the beds on the north side of the fault. Note the slight drag in the bedding on the two sides of the fault zone and the fault breccia which marks the zone itself.

The break in the basaltic lava flows in the valley to the right is the result of stream erosion probably related to the discharge of water from Lake Bonneville.

54.6 Note the outcrop of basalt immediately below the roadway; this is one of the very few exposures of basalt along the southwest and south walls of the Portneuf Valley.

54.9 The outcrop of basalt toward the northeast shows a mound of sedimentary materials which was overridden by the lava flows. A similar feature is to be noted about one-fourth of a mile farther north; there is a well-defined soil profile in the top of the sedimentary series.

55.4 SLOW – Note the pressure ridges exhibited by the surface of the basalt immediately to the right of the roadway. Observe, also, the water polishing of the basalt. On the left-hand side of the roadway is the Inkom Ballast Bed. From this the Union Pacific Railroad earlier quarried the Cambrian Brigham Quartzite to be used as ballast along its tracks. The materials now being quarried are shale (Spence Shale member of the Cambrain Langston Formation) and limestone (Cambrian Ute, Langston, and Blacksmith Limestones) for the raw materials for the Ideal Cement Plant at Inkom which is just to the right of the road.

55.8 Sharp turn toward the left. Note water rounding of the basalt columns along both sides of the roadway.

56.4 A break in the basalt can be seen where Portneuf flood waters discharging through the Inkom "narrows" eroded away the columns of the basalt. The valley of the Portneuf River widens westward here and the basalt once more occurs in the valley because of the reduced erosive force of the spread-out river.

56.9 Scabland topography shows in the basaltic flows to the right as well as bar deposits built up of rubble eroded from the basaltic columns.

57.6 Roadway crosses a broad alluvial fan formed at the mouth of the tributary entering the valley of the Portneuf River from the south. The lava north of the roadway shows at least two very distinct flow levels.

58.2 On the north side of the Portneuf valley, two slide areas with hummocky topography at their bases are visible.

58.7 Just below road level on the right is a very wide meander loop of the old course of the Portneuf River.

59.6 On the north (right) side of the Portneuf Valley alluvial material coming from the hills on the north side has covered the basalt flows and obliterated the south-facing scarp of the upper flow.

60.2 Turn left.

60.3 Note that the valley is here constricted once again and that this constriction has crossed a narrowing in the flow channel of the old Portneuf Valley. Such a constriction necessarily increased the velocity of the Portneuf flood waters coming through the gap and, by plucking, eroded the lava flow from this point to the mouth of the gap another mile or so farther west.

62.2 Turn right. Basalt flows reappear.

End of basaltic lava flow can be seen ahead to the left. Ahead and toward the right is an outcrop of the Bannock volcanics of Cambrian age.

62.7 STOP. Turn left onto highway. Roadcut exposes a lava flow which extends from here to Pocatello.

67.2 This is the northernmost extent of the Portneuf Valley basalt flow.

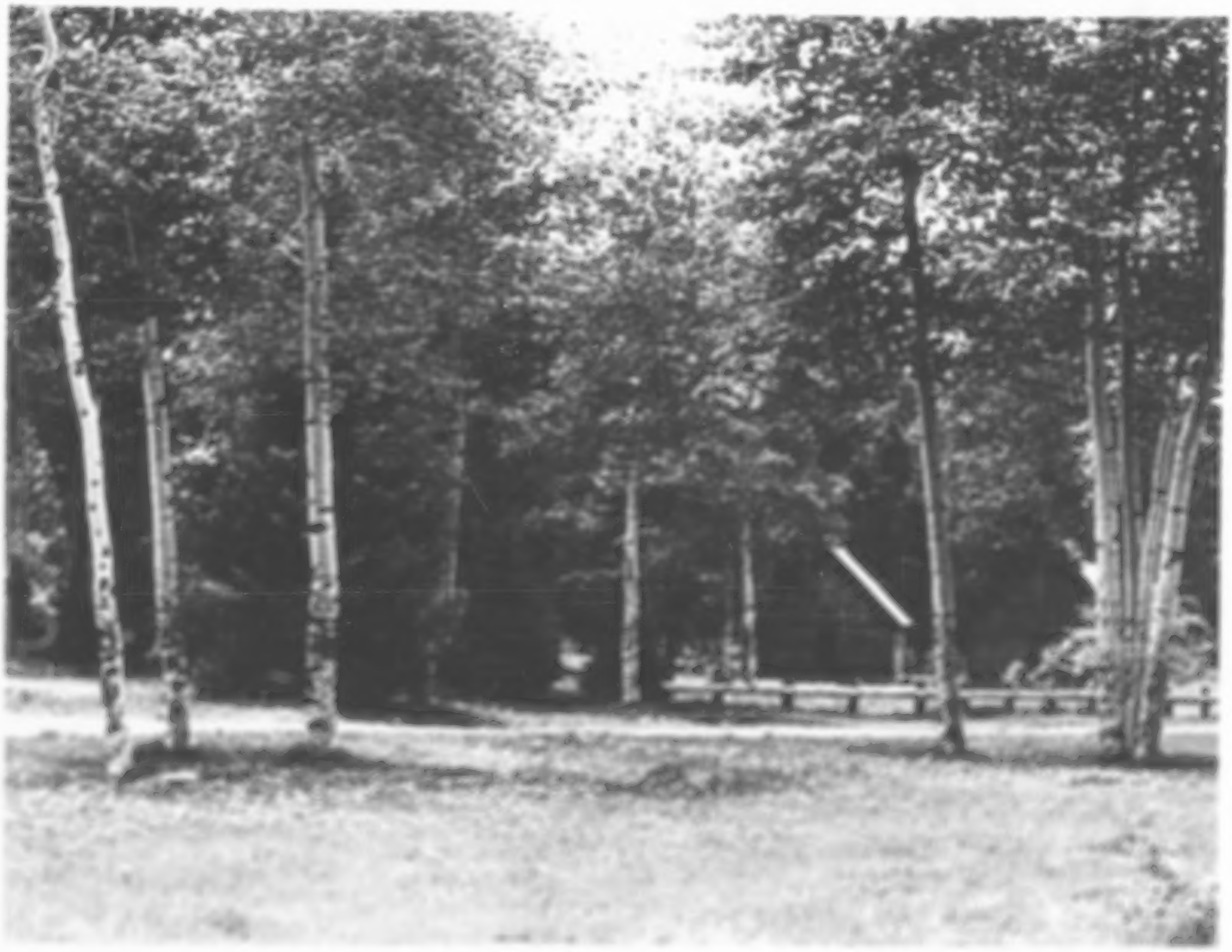


FIGURE 34
Aspen Grove

MINK CREEK — THE POCATELLO WATERSHED

MAP: Pocatello 15'

Mink Creek, which flows into the Portneuf River south of Pocatello, furnishes water for the City of Pocatello. The area through which it flows offers opportunities for understanding the importance of a watershed, and the complex factors which need to be considered in its management. Vegetation and wildlife may also be studied; the trip outlined here is used for nature study by teachers, students and by groups such as the Cub Scouts. For information regarding the geology of the area, see the Hawkins Basin Field Trip, Section 3, Tour 5.

The following material is from a brochure prepared by the Caribou National Forest.

The Story of Mink Creek

The 20,000 acres which make up the Mink Creek Watershed were originally in the Fort Hall Indian Reservation. By special Act of Congress on March 3, 1891, Pocatello City was given permission to use water from the Reservation. On June 17, 1902 Congress eliminated this area from the Reservation. As soon as it was opened to public use, it was overrun by sheep.

Residents of Pocatello feared contamination of their water supply and circulated a petition, asking that the President of the United States set aside a Federal Reserve. This was done in 1903 and the area was designated as a watershed for the City of Pocatello. It has since been the responsibility of the Forest Service to provide for wise use of the resources that make up the watershed.

Primary concern in the management of this part of the Caribou National Forest is to maintain a usable and dependable supply of water. In addition to the 1,500,000 gallons of water used daily by Pocatello's 26,000 residents, 1,000 acres of land are irrigated by water from the Mink Creek Watershed. The principal crops that are irrigated by this water are hay, grain, potatoes and fruit from the orchards.

Recreation is restricted to two improved areas: Cherry Springs Picnic Area and Justice Park. Over 40,000 visits are made to these areas during the summer. The Girl Scouts and the Campfire Girls each have organization areas used by 500 girls in the summer.

Recreation use is not allowed on the areas from which Pocatello's water supply is taken.

Part of this area is a State Game Preserve. The Mink Creek watershed is the home of approximately 650 elk and 1,600 deer. The game herds are handled under a management plan drawn up cooperatively by the Idaho State Fish and Game Department, the Forest Service, the Bureau of Land Management and interested groups. Surplus game is removed annually under a regulated special hunt. The number to be removed is determined annually by those responsible for the management plan, from recommendations of a Big Game Board which is made up of one representative from each of the agencies and interested groups.

The entire watershed is protected from fire with livestock grazing regulated to maintain good watershed conditions. All uses are supervised so they will not interfere with the primary function of this area: Production of usable water in a dependable supply for the City of Pocatello.

(Numbers correspond to those on map)

1. Valve house. Here is an intake for a portion of the Pocatello water supply. Every day 1,500,000 gallons of water flow through this valve house into the Pocatello water supply line.

2. Stop here to see an excellent watershed cover – Douglas fir timber, with many young trees for future watershed protection, aspen, brush, good perennial grasses such as wheatgrass, fescue, brome and pinegrass, and various weeds or broadleaf plants.

3. Here are spring houses, the main source of the water supply. They are protected from grazing and closed to recreational use to insure pure water. (There is no road up West Mink Creek, stops 2 and 3. Access is by foot or horse back.)

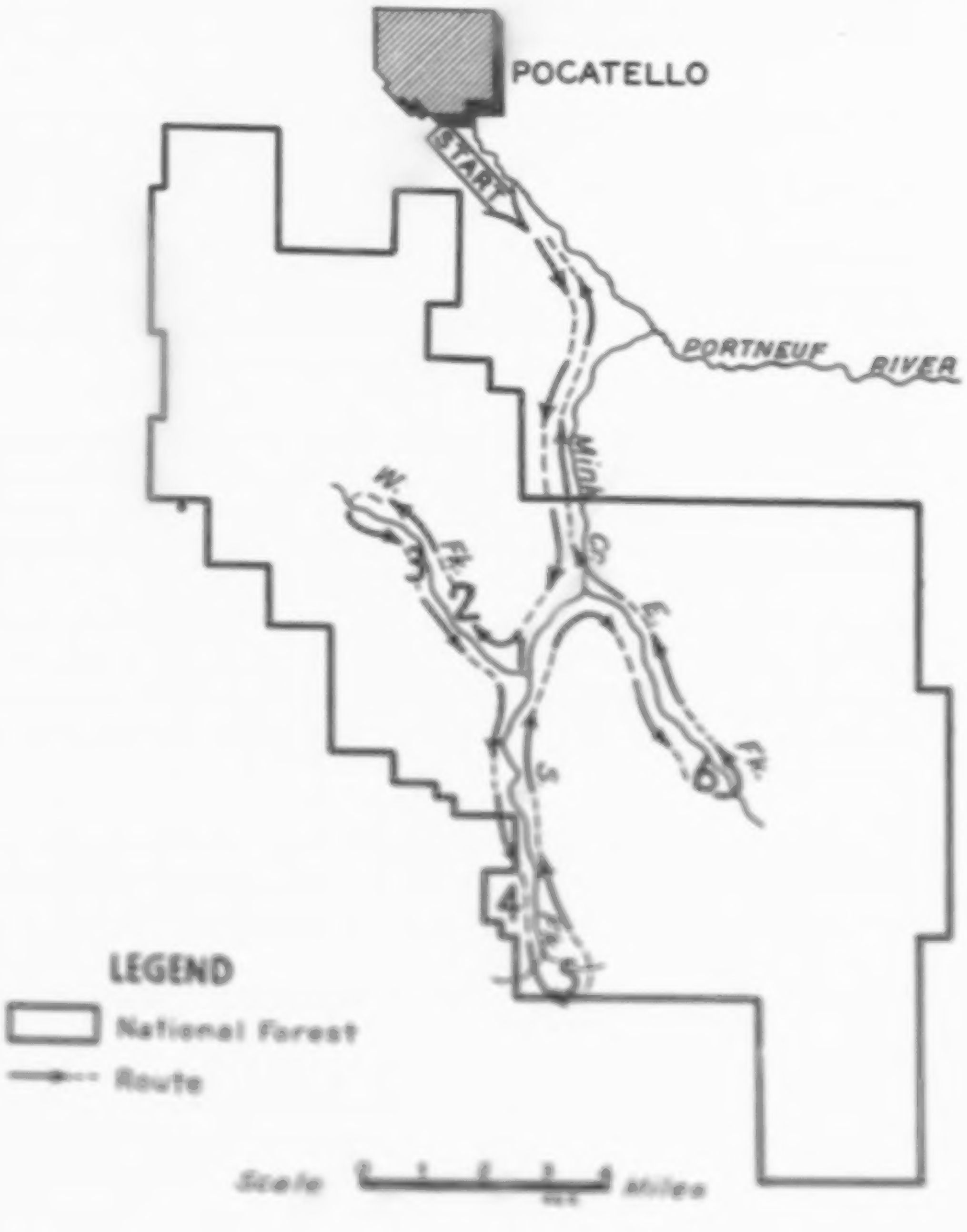
4. An experimental plantation. In 1915 the Forest Service planted 160 acres of Western yellow pine here. The trees have grown in the 35 years to reach up to 14 inches in diameter, breast high, and from 35 to 40 feet in height.

5. More good watershed cover here. Plant roots hold the soil in place. When the plants die they form a protective litter on the ground. The decayed plant roots maintain the soil fertility.

Watch for signs of activities of beaver along the creek.

6. A stop to look beyond the watershed to see the dependent valley below. From here can be seen the valley life, business, agriculture and industry dependent on mountain water.

MINK CREEK — THE WATERSHED



TOURS FROM SODA SPRINGS

By Ralph Reeves, Science Teacher, Soda Springs High School, Soda Springs, Idaho.

North Through Caribou National Forest

Obtain a map of the Caribou National Forest from Forest Ranger at 40 East Second South, Soda Springs.

Visit Grays Lake National Wildlife Refuge Office at 51 West Center, Soda Springs, for interesting exhibits and information on the Refuge (see study trip guide).

0.0 World's largest CO_2 geyser ½ block north of Wildlife Refuge Office, or 1 block northwest of Caribou County Courthouse. Proceed northbound on State Highway 34. Refer to tour map, Page 196.

2.8 Monsanto's large phosphorus plant. Here coke, quartz and rock phosphate are heated in large electric furnaces to obtain white phosphorus. The white phosphorus is shipped to eastern points where it is made into soap and other products such as phosphoric acid for Coca-Cola.

3.6 Turnoff to Trail Canyon. A ski-tow is located a few miles up the canyon on a scenic drive. Formation Springs with its travertine terraces is also located here. This makes an interesting side trip, if desired.

Continue on Highway 34.

6.3 Conda turnoff. A two-mile drive to Conda presents a fine view of the J.R. Simplot Company Conda Mine and Mill (see study trip guide.)

7.4 Continue north on Highway 34. At this point the highway crosses a large fault. Note the depressed area 100 yards wide to the south of the escarpment, which is typical of faults. Along the San Andreas fault of California, these depressed areas are occasionally occupied by lakes.

This fault continues NW toward the west side of China Hat.

12.4 Junction with China Hat road. China Hat is a composite volcanic cone composed of rhyolite.

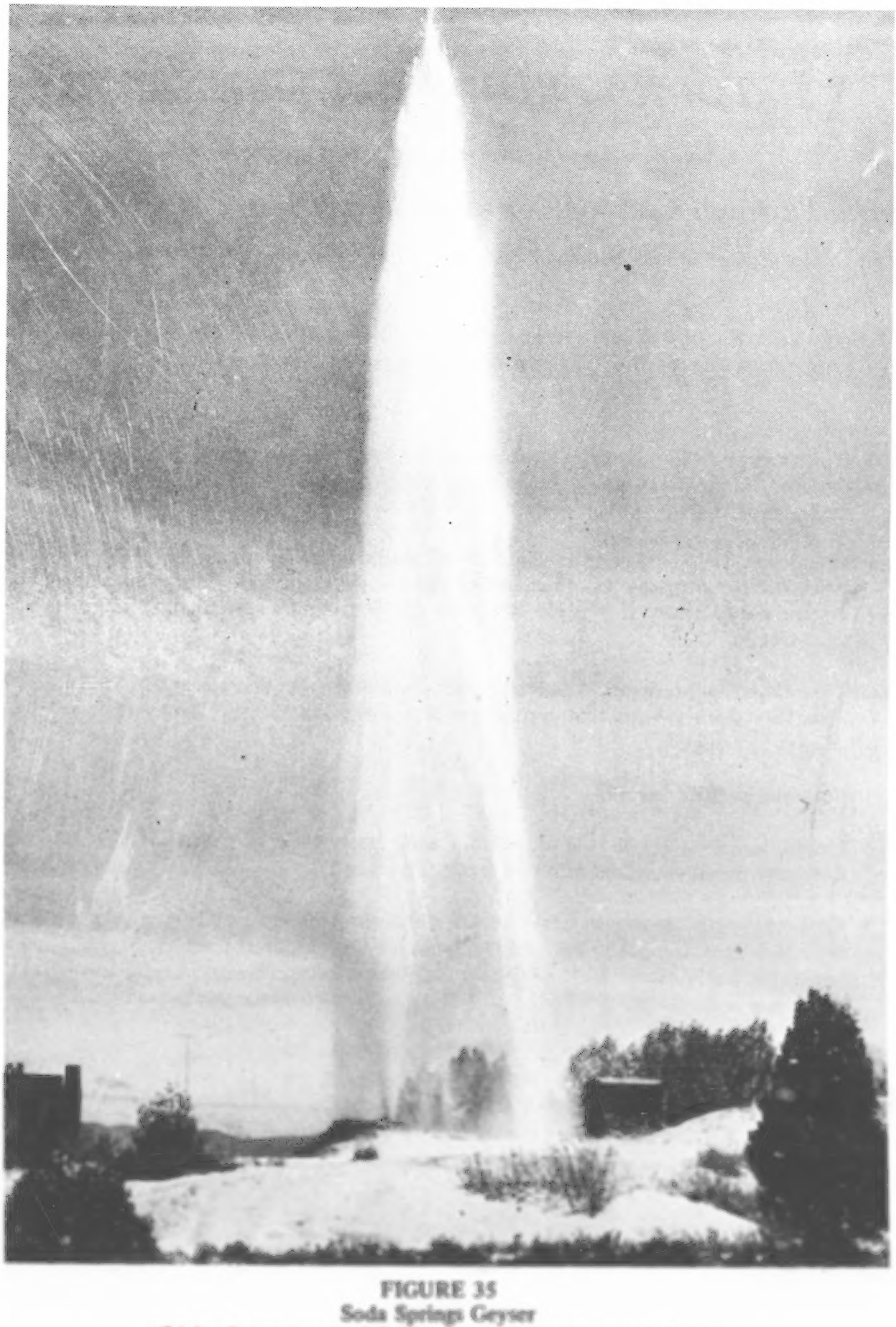


FIGURE 35
Soda Springs Geyser
(Idaho Department of Commerce and Development photo)

12.8 Turn east off Highway 34. A sign at this intersection reads "Trail Guard Station 14 miles". This is a black top road.

13.2 Blackfoot River, Idaho Fish and Game Access to river area.

16.4 Monsanto's Ballard Mine where rock phosphate ore is obtained from the Phosphoria formation of Permian age.

18.0 Sediment filled valley. What geologic events have caused this? Notice the character of the river's flow.

23.4 Turn left, cross railroad tracks and continue north on west side of Blackfoot River. A sign at this intersection points toward Georgetown. Don't go toward Georgetown! Stay on main road.

23.8 Stauffer Chemical Company's mine. Note the brown color of the Phosphoria Formation due to organic matter. This formation was deposited in shallow ocean depths during the Permian period.

24.7 Enter the Caribou National Forest.

24.9 Enter "The Narrows". Notice that the river's flow at this point is rapid, a characteristic of a young river.

26.7 Mill Creek Canyon Campground, a delightful picnic area with drinking water. A nice place for a hike. This is about 0.4 mile from the main road. Many elk in this area.

27.2 Trail Guard Station east of the road. Continue north on the main road. Note how different the flow of the river is. How do you explain this?

29.5 Turn east on Road No. 102 about ½ mile to Lanes Creek. Here you can see an excellent example of an old river with many cut-off oxbows. Return to the main road and head north again. Mileage continues, with this junction recording 29.5 miles. (The mileage listed does not include any side trips.)

33.0 Alluvial fan across the valley to the east. A number of alluvial fans may be seen a mile or two away on the east side of the valley. Watch for moose from this point north for several miles. With binoculars you may see the overgrazed trees just above the alluvial fans, where deer and elk have denuded the juniper and other trees as high as they can reach during the winter. (Bacon Creek, Bacon Ridge.)

37.5 First view of Caribou Mountain straight ahead to the north. Caribou Mountain contains volcanic intrusions into sedimentary rocks. This igneous rock is a light-colored basic rock associated with gold in Colorado. The Caribou Mountain area was a major producer of gold in the late 1800's and some minor hydraulic mining occurred in the mid 1960's. Continue generally north-bound taking the road toward Gray.

41.7 The road has just descended a steep grade and now junctions with another road. Just north of this intersection you can see the ruts of the old Lander Trail descending the hillside.

Turn right (north).

42.7 Wayan Store and Highway 34. Head north (left) toward Grays Lake. Specimens of Tempskya – a petrified tree fern have been found northeast of here in Swains Hollow, but the area has been searched over and specimens are becoming rare.

44.8 Turn right at this junction, leaving Highway 34 and heading due north toward Grays Lake.

47.6 Grays Lake Guard Station. Notice Bear Island to the northwest in the middle of Grays Lake, which is a large lake being filled with peat. Notice the dikes near Bear Island, which were constructed by the Grays Lake National Wildlife Refuge to provide water levels favorable for nesting of waterfowl.

49.9 Public access to the Grays Lake Wildlife Refuge. Check on the status of this access with the office in Soda Springs. You may walk or drive to the dikes and observe nesting waterfowl.

54.4 Willow Creek Road, sign reading "Monte Cristo Mine – 4 miles". A good view of a cirque on the north slope (NNW) of Caribou Mountain. This road (Willow Creek Road) goes quite near the cirque (a tremendous view!) and then through the ghost town of Keenan City and north to road No. 087 near Caribou Guard Station. Passable June 1 to October 1, **pickups only!**

OPTIONS: You may proceed north and west to Idaho Falls via Bone Store from this point, or complete the circuit around Grays Lake, returning to Highway 34 at the southwest corner of the Lake, or return to Highway 34 past the Grays Lake Guard Station, returning to Highway 34 at the southeast corner of the lake.

This Tour Guide takes the latter course.

63.8 Turn west (right) on Highway 34, skirt south side of Grays Lake.

66.7 Water level gauge. On the right is Beavertail Point – an Indian massacre occurred here. In the small alluvial deposit on the south side of the road as it curves around Beavertail Point are two depressions where victims of the massacre were buried.

70.0 Water level gauge is at artificial outlet to Grays Lake. This outlet was constructed by the Indian Service to supply additional water to the Blackfoot River Reservoir. This gauge is near Mile Post 88.

70.8 Junction with road leading around west side of Grays Lake. If you elected to travel around the Lake this is the road from which you rejoin Highway 34.

72.2 Chubb Springs, a fault-related spring between Mile Post 86 and 85. The highway is on a fault scarp at this point with Chubb Springs just west of the highway.

The highway soon drops off the scarp and then parallels it for several miles south, with the fault scarp on the east (left).

79.1 Henry. Access to Blackfoot River Reservoir at Whitelock's, which is 200 yards west of the highway. Across a foot-bridge and right 100 yards is a large spring with many mineral deposits.

86.5 Leave Highway 34, turning west toward China Hat. For the next six miles this tour takes you through an amazing collection of horsts and grabens. Each hill is a horst, each valley is a graben. Fault scarps nearly 100 feet high are found along this road. Crag Lake occupies one of these grabens; water from the Blackfoot River Reservoir leaks to the south through some of the large faults.

88.1 Road leading north to Blackfoot Reservoir and a close look at Crag Lake if you wish. To see Crag Lake, turn left just before reaching the small buildings on the shore of Blackfoot River Reservoir. Mileage on this tour guide does not include this side trip of a couple of miles.

88.5 Pass China Hat.

89.3 View of Crag Lake to the right. Water may not be visible from this road in dry weather.

90.7 Turn south (left) on blacktop road. The road drops into a large graben almost immediately.

92.4 Leave graben. Notice the cinder cones a mile or two to the left.

96.8 About a half a mile west of the blacktop a cinder cone occupies a crater. One may drive to the cinder cone on a fair road, or drive part way and walk the remainder. The east and north sides of the cone are especially interesting.

Note the age of the volcanic rocks for the next mile or two. At this point little soil covers the basaltic lava flows. Contrast this with the area south of the spring at 97.8 miles (flows are covered with several feet of loess-wind deposited soil). What does this indicate about the comparative age of the flows?

97.8 Large spring on right side of road. This spring remains ice-free all winter and is occupied during that time by waterfowl. To the east of the blacktop is Fivemile Meadows, an area which became much wetter with the construction of Blackfoot River Reservoir.

99.0 Monsanto's quartzite mine may be seen to the west. Here quartzite is obtained for use in the electric furnaces.

101.2 Hooper Springs, a large CO_2 springs and fine picnic area. Dry lemonade mix is good with "Hooper Water".

103.6 Having continued south-bound on the blacktop since mile 90.7, you have now reached the CO_2 geyser in Soda Springs.

End of Tour.

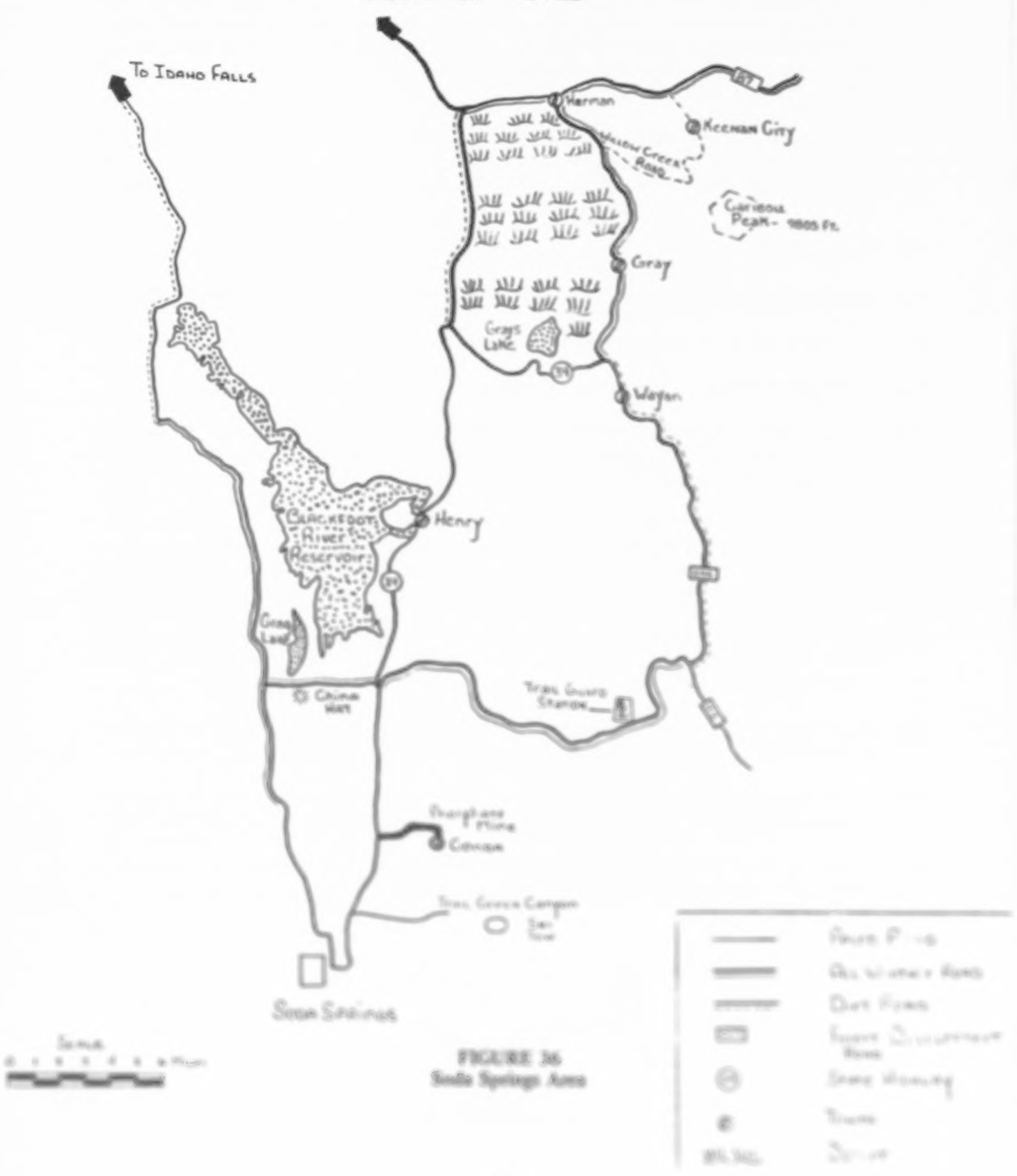

To Idaho Falls - 45 miles
To Idaho Falls
Herman
Keenan City
Willow Creek Road
Caribou Peak - 9803 Ft.
Gray
Grays Lake
34
Wayan
Henry
Blackfoot River Reservoir
34
Grass Lake
China Hat
Trail Guard Station
Phosphate Mine
Conda
Trail Creek Canyon
Soda Springs
Scale
Paved Road
All Weather Road
Dirt Road
Forest Development Road
[illegible]
Towns
Swamp

FIGURE 36
Soda Springs Area

South into Cache National Forest

Materials: **Map of Cache National Forest**
H_2O_2 to test for MnO_2
HCl diluted 10 parts water to 1 part acid, to test for carbonates.

0.0 CO_2 geyser in Soda Springs, one block northwest of courthouse. Proceed east on Highway 30N.

0.6 Turn south by junior high school at the Forest Service sign pointing towards a campground. Proceed south on asphalt road across a lava flow, cross the Bear River. At this point the rocks change from igneous to sedimentary, and Qal (Quaternary alluvium) and glacial moraines are common. A glacial moraine (a small hill) may be observed a quarter mile west of the bridge.

5.9 Turn left (east) at the Bailey Creek Junction. From the divide between Bailey Creek and Eight-mile Creek, one can see north across the valley, viewing China Hat and other volcanic cones in the distance. A really nice view. Note that the higher, steeper areas are all sedimentary in nature and the flatter areas (valleys) are all igneous, except for relatively thin coverings of alluvial sediments in some areas.

7.8 Turn right (south) at this junction, toward "Eight-Mile Creek". Note the character of Eight-Mile Creek; meandering from mile 7.3 to perhaps mile 9. The cultivated valley is composed of soil transported by water or ice. As we continue south the stream becomes faster running and straighter, instead of meandering.

11.5 Enter Cache National Forest. If a Forest Ranger is present at the guard station, a map may be obtained from him.

12.5 Picnic grounds on the right, adjacent to Eight-Mile Creek.

13.0 Junction. Campground and picnic ground. A fine spring rises 200 yards west of this junction. It is called Cold Springs. This campground is a good place to park a school bus. **It is probably not prudent to take the bus further**. On the east side of the junction is a small area of land slippage, causing trees to grow with curved trunks as the ground beneath them slips very slowly downhill, tilting the trees.

Discussion question: Where does the water of Cold Springs come from? What kind of rocks does it come through? Is it soft or hard water? Draw a sketch showing what you think the rock formation might be like. Use the usual symbols for the kinds of rocks you think might be present. Test some of the rocks around the spring with HCl. What is the balanced chemical equation for the reaction you observe?

It is 3.0 miles to Cheatback Basin, a large sink area. **This would make a fine hike**, as the road goes mostly through the forest. A good place for a biologist! One could easily hike off the road through the trees – especially on the return trip.

13.6 A number of large beaver ponds may be found here. Beaver have captured considerable silt, and the fall in elevation from the upper pond through the lower one is considerably more than usual and illustrates quite clearly the manner in which beaver ponds store water and control erosion.

Discussion questions: What forms of wildlife may be found in or near the beaver ponds? What effect do the ponds have on the environment that encourages each of these forms of wildlife to live in this area? What effect do the ponds have on erosion? On the availability of water during the summer months? What effect do the beavers have on the growth of nearby vegetation? What types of rocks are revealed by the road cut? (Shale with a black coating on some surfaces.) Test any soft black deposit with H_2O_2. Organic matter of MnO_2 (manganese dioxide) will react with H_2O_2 liberating oxygen (test is positive).

14.2 Turnout with fine view of Sherman Peak to the southeast. Peak is composed of erosion-resistant quartizite.

16.0 Cheatback Basin is a large depressed area with no surface drainage, covered mostly with grass. It covers a few hundred acres and has some relatively small sinkholes (karst topography). Elk and deer abound in the area. As the road leaves the Basin continuing south, a few fine examples of sinkholes may be seen. Soda Peak lies immediately to the north.

Discussion questions: Is it possible that Cheatback Basin might be related to Cold Springs in some way? Test some rocks in the sinkholes with HCl. What kind of rocks are these? How does excess water drain from Cheatback Basin?

Sinkholes such as found here are present along the crest of the Wasatch south into Utah, at least as far as Beaver Ski-Lift. Minnetonka Cave is located west of Paris. What causes sinkholes and caverns?

Return to Soda Springs by the same route.

General Area Information West of Soda Springs

MAPS:	**Soda Springs Quadrangle**	**15'**
	Bancroft Quadrangle	**15'**
	Preston Quadrangle	**15'**
	Portneuf Quadrangle	**15'**

Although specific mileage is not given for this tour, most of the features listed are easily recognizable and with the use of maps, (highway, forest service, or topographic) they should be located without difficulty.

U.S. 30 follows the route of the Old Oregon Trail along the north side of the Soda Point Reservoir, formed when the Bear River was dammed at a point 5 miles west of Soda Springs. Vegetation in this part of the state is chiefly aspen, lodgepole pine, limber pine and Douglas fir trees; maple, serviceberry, chokecherry and wild rose; and lupine, violet, daisy, paintbrush, and wild carrot, along with other wildflowers.

Soda Point itself, once called Sheep Rock because of the number of mountain sheep seen there, is the prominence south of the dam and western end of the reservoir. Composed of sedimentary carbonate rocks, it is the northernmost edge of the Wasatch Range.

A most interesting phenomena can be viewed in this area. The Bear River, which has been flowing in a northerly and then westerly direction, suddenly turns due south. What caused this change in course? From the dam and from other viewpoints along the highway to the west, it appears that lava flows apparently pushed the Bear River right up against the Wasatch Range, and then caused it to turn and flow south for several miles before it was again deflected west by lava flows originating south of Grace.

Can you locate the craters from which the lava might have come? Was there just one flow in this area or were there several? Is there any indication as to the age of the flow (s) – hundreds, thousands, or millions of years old?

From the Hudspeth's Cutoff Historic Site turnout on U.S. 30 N there is an excellent view of a young fault which passed in a north-south direction along the base of the Soda Springs Hills to the north.

Southwest of Grace, the Bear River has cut a spectacular canyon several hundred feet deep. Crawfish can be found at the beginning of the canyon,which is known locally as Black Canyon. There are fine exposures of pillow basalt and pahoehoe lava also at the mouth of the canyon. At this point, the Bear River is a good example of a young river, in contrast to its meandering character southeast of Soda Springs. Leaving the canyon, Bear River flows through Gentile Valley. The silty loam of this narrow valley grows wheat and, with irrigation, alfalfa and other crops. Stock raising continues to be important, as it was when this area was first settled in the 1860's.

Further south, after meandering through Gentile Valley, Bear River cut another canyon, which has been dammed for power. The river then goes through a steep 500-feet deep section called the Oneida Narrows through which the waters of ancient Lake Thatcher drained.

On further south is Preston, the oldest town in the state.

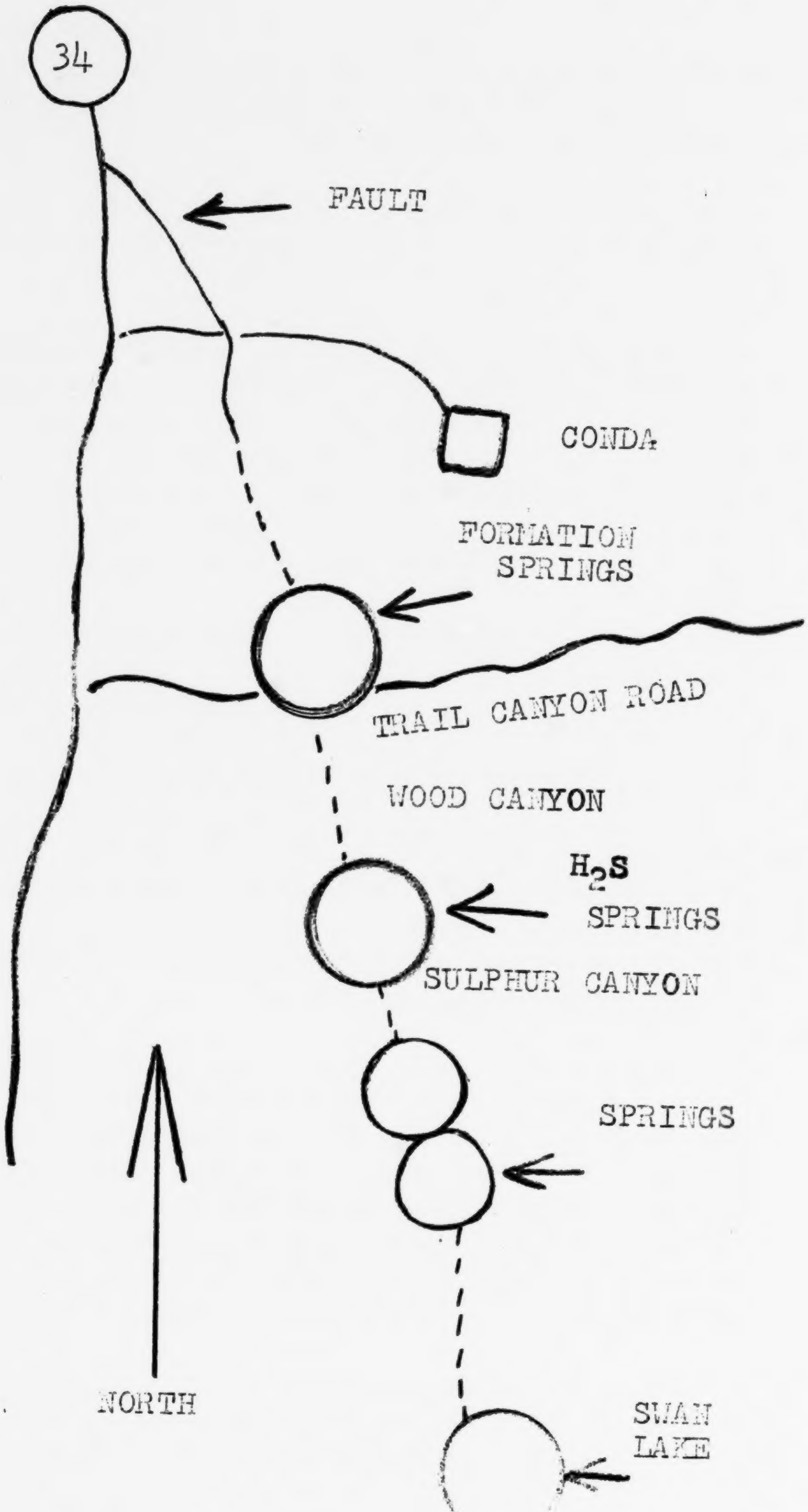
Going back to the vicinity of Grace, one of many caves of the area is located 3 miles south of Grace, just east of State Highway 34. Twenty-seven hundred feet long, fifty feet wide, twenty-five feet high, and said to contain ice all year around, the mouth of the cave is now obstructed with junk – a monument to man's insensitivity and lack of appreciation for his environment. Inquire locally if you wish to explore the cave.

To the northeast is another type of cave – actually a recess in a travertine cliff formed by mineral springs deposits along Eighteenmile creek, 7 miles north of Bancroft. From the Portneuf Valley near Hatch or Chesterfield, you can look eastward and see travertine terraces at the mouths of Eighteenmile and Little Flat Canyons. The one on Eighteenmile Creek stands about 100 feet above the adjacent slopes with its upper fifty feet almost sheer cliff. The one across Little Flat Canyon, 1½ miles southeast, is not as high but is nevertheless quite striking. The terrace extending across the mouth of Twentyfourmile Creek Canyon, north of Chesterfield, while much smaller is probably still in the process of deposition from mineral springs in the area.

Because of the sedimentary nature of the rocks of this area, fossils are numerous. Crinoid stems, brachiopods, branching bryozoans and others of the Pennsylvanian, Permian and Triassic periods have been found in the limestone and shales of the hills in this regions.

For further information see: C.R. Mansfield, Geography, Geology, and Mineral Resources of the Portneuf Quadrangle, Idaho, U.S.G.S. Bulletin 803, 1929.

Southeast on U.S. 30



0.0 Leave CO_2 Geyser in Soda Springs, head east on U.S. 30 North.

4.8 Leave highway, turning north at "Sulphur Canyon" sign. This is 100 yards east of some ranch buildings on the highway.

6.6 Junction in the road. Park here. 200 yards to the northeast is a large area (10-20 acres) of springs which yield, in addition to water, considerable quantities of obnoxious hydrogen sulfide (H_2S) gas. A short hike to the site of the springs will enable one to see the "blow holes" left by escaping gasses.

The left road goes across the divide into Wood Canyon to the north, where more springs of this type are found. This road is best traveled by pickup.

7.2 If you hike down the road to the right (east), you will see the remains of an old sulphur recovery operation about 300 yards to the right (south) just beyond the small stream. Here the sulphur was distilled from the waste material. Native sulphur may be found here, and springs colored white with finely divided sulphur may be seen near the stream. H_2S exposed to the air is partially oxidized according to the following equation:

$$2\,H_2S + O_2 \rightarrow 2H_2O + 2\,S$$ (Origin of sulphur deposits)

Discussion: These two springs, plus Swan Lakes (springs) to the south, the sulphur springs in Wood Canyon, and Formation Springs west of the mouth of Trail Canyon, lie along a gently curving line (see diagram page 200). Could these springs perhaps have a common origin? If this line is extended to the north, it meets the revealed end of the fault that crosses Highway 34 near Conda. What does this suggest? Southwest of the springs where sulphur was once recovered, there is a notch in the mountain and a sudden change in its slope. What is the significance of this? Might a fault cross here?

While in this area look for evidence of overbrowsing of winter range by deer and elk which is visible along most any part of the mountainfront south to Georgetown.

Return to highway and continue south.

8.4 Eight-Mile Creek Canyon may be seen to the southwest across the Bear River. The high peak to the south is a quartzite ridge called Sherman Peak. There are numerous sink holes south of Soda Peak continuing down the mountain ridge into Utah where they may be seen on the highway east of Beaver Ski-Tow.

10.7 Turn left to Swan Lake at the sign. The travertine terrace, formed by Swan Lake in more active days, may be easily seen beyond the ranch buildings and is quite spectacular. When you reach the terrace keep left to Swan Lake. If your speedometer reads more than 1.5 miles from Highway 30, you've missed Swan Lake!

Return to highway and continue south.

12.5 Road leading up Diamond Gulch to the left where can be seen a good example of rehabilitation and revegetation of an old strip mined area.

14.5 Fossil Canyon sign, turn left. The El Paso Company natural gas pumping station is just beyond this turnoff approximately one mile. The road climbs steadily up a dissected alluvial fan.

15.3 Cross natural gas line.

15.6 Side road. Keep right.

16.3 Park busses and low-slung cars near the fence. Note the aspen trees just beyond this point. Aspen trees indicate plenty of moisture. Marine fossils, such as horn coral in limestone, may be found in talus along the road for the next mile or two.

17.9 Sign "Fossil Canyon Trail" and "Big Basin 5 Miles." Note the difference in vegetation on the north and south-facing slopes. Sagebrush grows on the warm, dry, south slopes, conifers on the cooler, moister north slopes, and aspens on areas of water seepage from underground sources.

Return to highway and head north back towards Soda Springs.

STUDY TRIPS

Many industries and governmental and educational agencies welcome visits by students and will provide guided tours of their facilities. Listed here is information to help in making arrangements for such visits. Contacts should be made at least two weeks in advance. Information regarding the time necessary for the tour, whether special clothing is needed, if picnic and restroom facilities are available, and whether there are any special restrictions should be obtained at the time of the first contact. Most of these are suitable for all grade levels unless otherwise stated; group size should not exceed 30 for most tours, although special arrangements may be made for larger groups in some cases. This is by no means a complete list. For example, most colleges and universities have displays of rocks and minerals, mounted animals and birds, and other displays in the hallways of their science buildings which are well worth a visit. Undoubtedly, there are other private collections or museums which could be visited if proper arrangements are made. Investigate your own community for local resources – you may find some within walking distance of the school. Make use of those opportunities for expanding your students' environment.

STUDY TRIP GUIDES
SECTION 1

BONNER COUNTY

U. S. FOREST SERVICE SANDPOINT SEED ORCHARD, Sandpoint. Seventeen-acre orchard being used for research into control of white pine blister rust, a tree killing disease.

STATE FISH HATCHERY, Clark Fork. Phone 255-2751. Guided tour of hatchery where rainbow, cutthroat, kamloop and kokanee are raised.

BOUNDARY COUNTY

KOOTENAI NATIONAL WILDLIFE REFUGE, Bonners Ferry. Phone AN7-3888. A brief explanatory lecture by the manager as to the purpose of the refuge, its scope and potential; possibly a slide talk. A tour of the refuge and of the display pond, identification of waterfowl.

CLEARWATER COUNTY

CLEARWATER-POTLATCH TIMBER PROTECTIVE ASSOCIATION, Box 546, Orofino. Phone 472-4111. Tour covers general protection problems, fire fighting, industrial forestry and regeneration.

IDAHO COUNTY

RAPID RIVER (CIRCLE C) FISH HATCHERY, Riggins. Phone 628-3277. Open year around; spawning salmon can be seen from late August to mid-September; velocity barrier 2 miles downstream where fish are counted.

KOOTENAI COUNTY

COEUR D'ALENE NURSERY, U. S. Forest Service, Coeur d'Alene. Phone MO4-5571. Slide-tape program (20 minutes) covering year-around operation; tour of physical plant including visit to nursery stock in seedbeds.

FERNAN RANGER STATION, Coeur d'Alene National Forest, Coeur d'Alene. Personnel are available to guide and discuss all phases of forest operations; communication center and weather station may be visited.

IDAHO FISH AND GAME DEPARTMENT, 2320 Government Way, Coeur d'Alene. Phone MO4-9236. Can see head mounts of antelope and mountain goat and a whole mount of a mountain goat kid; also a number of different pelts; slides on many wildlife subjects can be shown at the office, or in classrooms.

INLAND EMPIRE PAPER COMPANY, Millwood, Washington (tour of woods near Spirit Lake, Idaho). Thinning, planting, seed collecting and processing; road construction, harvesting and other features of tree farms.

LATAH COUNTY

FOREST SCIENCES LABORATORY, U.S.D.A. INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION, 1221 South Main St., Moscow. Phone 882-3557. Tour covers forest genetics silviculture, forest insects and diseases, watershed management, timber measurement and management planning. Well-written brochure available for preplanning. Best suited for grades 9-12.

SIMPLOT BOVILL MINE, P. O. Box 647, Bovill. Phone 826-2901. Tour of open pit mining operation, clay and silica. Grades 8-12 only.

NEZ PERCE COUNTY

POTLATCH FORESTS, INC., P. O. Box 600, Lewiston. Phone 799-1483. Tour illustrates utilization of forest harvests, demonstrates role of forest industry in supplying man's needs; demonstrates multiple use forest management practices under modern industrial tree farming.

LEWISTON FISH LADDERS, Idaho Fish and Game Department, Lewiston. Phone 743-6502. The Regional Conservation Educator will give a slide talk on general wildlife, and migrating anadromous fish can be seen during October and November, and in March, April and May.

SHOSHONE COUNTY

THE BUNKER HILL COMPANY, Kellogg. Phone 784-1261, Ext. 319. Prepare by studying importance of mining in Idaho. Color brochure on mining and smelting operation is available. Normally only a trip through the lead smelter is made, however, can possibly include mine surface plant on some dates. No underground trips available because of two mile adit to Bunker Hill where ore trains are busy all day. Grade level: sixth grade and up.

SUNSHINE MINES, between Wallace and Kellogg. Tours during summer months every Thursday from 12:00 Noon to 3:00 p.m., surface plant only (no underground tours). This is the nation's largest silver producer.

GALENA MINE, P. O. Box 440, Wallace. Phone 752-1116. Surface installation of deep mining operation. No underground trips except to college level mining, geology, or earth science students who are over 18 years of age.

HECLA MINING COMPANY, LUCKY FRIDAY MINE, Mullan. Phone 752-1251. Tour at surface plant including underground hoisting operation, ore transportation operations. Open for tours only in summer, restricted to high school students.

STAR MINE, Burke. Primarily lead-zinc operations. Tours being at 7:30 a.m., June through August.

STUDY TRIP GUIDES
SECTION 2

ADA COUNTY

PULLMAN BRICK COMPANY, 7901 Warm Springs, Boise. Phone 342-4047. Can see brick-making operation – mixing of clay through drying.

PORTER BROTHERS MINING OPERATIONS, 2261 Warm Springs, Boise. Phone 344-3505. Can see dredge, actual separation of black sands into the ores columbite and euxenite. 18 different minerals – will show samples. Not in operation during the winter months.

ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION – WEATHER BUREAU AIRPORT STATION, P. O. Box 4345, Terminal Bldg., Municipal Airport, Boise. Phone 344-2231. Contact meteorologist in charge. Explanation of purposes of the bureau's services, its instrumentation and functions. Grades 6-12 only.

IDAHO DEPARTMENT OF HEALTH – LABORATORIES DIVISION, 2120 Warm Springs Avenue, Boise. Phone

344-5811, Ext. 366. Series of health laboratories: microbiological, radiological, virus cytogenetics, chemical, pesticide, stream pollution, etc. Science students only.

BOISE CASCADE BARBER MILL, three miles east of Boise on State Highway 21. Phone 385-9381. A complete sawmill making finished lumber for market. Normally operated Monday through Friday, 9-11 and 1-3. Not advised for children under 10.

STATE FISH HATCHERY, Eagle. Phone 939-6744. No restrictions as to hours. Anyone can come anytime from 8 a.m. to 8 p.m. Can hear lecture and see slides as well as actual hatchery operations. Visitors center has fish in display tanks, pictures and recorded lectures.

ADAMS COUNTY

BOISE CASCADE CORPORATION MILL, one-half mile north of Council. Phone 253-4225. Sawmill cutting logs into lumber for shipment to Emmett. Log yard with sorting and shipping. Not advisable for children under 10.

BOISE COUNTY

LUCKY PEAK FOREST NURSERY, 17 miles east of Boise on State Highway 21. Phone Boise 343-1977. Can see 20-minute self-operated slide-tape program showing all phases of the operation. Also visit whatever activity is going on at the time and visit cone kilns and seed extraction plant.

BOISE NATIONAL FOREST BOISE BASIN EXPERIMENTAL FOREST, just north of Idaho City. Phone Idaho City, 392-4421. This program seeks to provide a wide range of solutions to the problems of forest management. At the station, programs are constantly changing.

BOISE NATIONAL FOREST SMOKEJUMPER HEADQUARTERS, Idaho City. Phone 392-4421. Can see parachute loft and packing facilities, jump equipment, protective equipment, tools, rations, and let-down procedures.

CANYON COUNTY

DEER FLAT NATIONAL WILDLIFE REFUGE, Route 1, Nampa. Phone 466-4811. One-fourth mile east of Upper Dam on Lake Lowell. Tour of refuge and discussion of management of waterfowl. General bird observations.

NORTHWEST NAZARENE COLLEGE OBSERVATORY, Nampa. Phone 467-8671. Dr. Gilbert Ford. Arrangements may be made for evening visits during the school year to view objects of seasonal interest through the telescope. No admission charge.

ELMORE COUNTY

SAWTOOTH LUMBER COMPANY, Mountain Home. Phone 587-4431. Can see full sawmill operation.

GEM COUNTY

BOISE CASCADE CORPORATION MILL, Emmett, Phone 365-4431. Teachers can obtain brochures for pre-planning. Can see sawmill, dry kilns, planers, cut-up plant, laminated beams, and bark products. A complete lumber manufacturing plant producing lumber and lumber products for market. Not advisable for children under 10.

GOODING COUNTY

U.S.D.I. NATIONAL FISH HATCHERY, Four miles southeast of Hagerman. Phone 837-4896. Guided tour of hatchery buildings where eggs are incubated and small fish started; rearing ponds areas where larger fish are reared; older students may tour lab and hatchery biologist will explain his work; also may visit adjacent Fish Nutrition Lab and learn of basic research there. May and September are best months for visiting. Most suitable for grades 5-9.

STATE FISH HATCHERY, Hagerman. Phone 837-4493. Largest state hatchery in Idaho. Complete hatchery operation can be viewed; rainbow, kamloops.

SNAKE RIVER TROUT COMPANY, 6 miles north of Buhl. Phone 543-4311. (Near Clear Lake) Tour of grounds and live trout in ponds. Can see trout being fed, caught for market and processed and packaged. Reprints of magazine articles explaining the operations are available. Largest trout farm in the world. Not open for public visits.

STATE FISH HATCHERY, Niagra Springs, Wendell. Phone 536-2283. Most highly automated steelhead hatchery in the world. (Operated by contract with Idaho Power Company.)

JEROME COUNTY

BLUE LAKES TROUT FARM, INC., P. O. Box 1237, Twin Falls. Phone 733-4631. (Plant located on Snake River, one mile west of Perrine Bridge.) Watch trout sizing and grading, dressing, boning, packing, shipping and other related operations.

STATE GAME FARM, one mile south and one mile east of Jerome. Phone 324-2782. Tour of facilities. Can see pheasant incubation and brooding operations. Many varieties of exotic birds in pens.

LINCOLN COUNTY

IDAHO'S MAMMOTH CAVE, seven miles north – 1½ miles west of Shoshone. Contact Dick Olsen, 301 Second Avenue East, Jerome, 83338, or phone 324-4772, Jerome. Indian artifact exhibit, nature exhibits. This is a typical lava tube, a huge cavern about 1 mile long, 30 to 40 feet high, with trails and lights. 25c per student admission charge, group rates. Open only in summer and fall.

MINIDOKA COUNTY

MINIDOKA NATIONAL WILDLIFE REFUGE, six miles northeast of Rupert. Phone 436-3589. Talk by refuge manager on the role of wildlife refuges, major objectives and general operation. Wildlife observations are best in late April and September when major waterfowl concentrations occur. Refuge leaflet and bird list which describes the area and forms of wildlife are available.

OWYHEE COUNTY

C. J. STRIKE WILDLIFE MANAGEMENT AREA, (Idaho Fish and Game Dept.), five miles west of Bruneau. Phone 845-2191. Insight into waterfowl management and developments for waterfowl nesting in southern Idaho. (Also can call Boise office of the Idaho Fish and Game, 344-8471, for resource person to come to schools with prepared slide talks.)

PAYETTE COUNTY

BOISE CASCADE CORPORATION PLYWOOD PLANT, three miles south of Payette. Phone 642-3321. This is the only plywood plant in southern Idaho. Makes finished plywood for market.

TWIN FALLS COUNTY

UNIVERSITY OF IDAHO TWIN FALLS BRANCH EXPERIMENT STATION. Headquarters, Route 1, Kimberly. Phone 423-5352. Tour of experiment station field plots.

SNAKE RIVER CONSERVATION RESEARCH CENTER, Kimberly. Phone 423-5582. Research facilities on soil chemistry, fertility, physics, soil mechanics; microbiology laboratories, and engineering laboratory; large irrigation and drainage laboratory; specialized isotope laboratories; constant temperature laboratories, also a greenhouse and growth chambers. Tour of complete operations at the Bean Disease Laboratory on Blue Lakes Blvd. in Twin Falls, (Phone 733-7721), can see bean hybridizing techniques.

VALLEY COUNTY

BOISE CASCADE CORPORATION MILL, McCall. Phone 634-2236. A complete sawmill making finished lumber ready for market.

BOISE CASCADE CORPORATION MILL, Cascade. Phone 382-2331. Sawmill cutting logs into lumber for shipment to Emmett. Log yard with log sorting and shipping. Not advisable for children under 10.

WASHINGTON COUNTY

IDAHO ALMADEN MINE, sixteen miles east of Weiser. Phone 549-0224. Visit to the mercury-extracting plant, the pozzolan plant and the open pit from which the ore is dug. Brochure, "The Pozzolan Story" which describes composition and uses of pozzolan, a cement-like material produced from calcined mercury ore, is available.

MERIDIAN PINE COMPANY, Box 66, Cambridge. Phone 257-3344. Can see full sawmill operations.

STUDY TRIP GUIDES
SECTION 3

BANNOCK COUNTY

J. R. SIMPLOT FERTILIZER PLANT, P. O. Box 912, Phone 232-6620, Ext. 322. Plant located 5 miles west of Pocatello. Tour of the plant exterior and description of plant operation. Chemical industry hazards prohibit the touring of the plant interior. Grades 9-12 only.

J. R. SIMPLOT QUALITY CONTROL LAB, Pocatello. Phone 232-6620, Ext. 245, Chief Chemist. Tour of control lab and research lab; fertilizer sample analysis and development of new processes and products.

IDAHO STATE UNIVERSITY MUSEUM, Pocatello. Phone 233-2160, Ext. 236. Director, Dr. Earl Swanson. Exhibits explain the story of the earth's history, geologic shaping of Idaho, the Idaho fossil record, prehistoric mammals of Idaho and Idaho's prehistoric Indians. Admission free.

BEAR LAKE COUNTY

STATE FISH HATCHERY, Grace. Phone 425-3257. (Located on Whiskey Creek.) Can see complete hatchery operation with rainbow and cutthroat trout.

BINGHAM COUNTY

J. R. SIMPLOT GAY MINE, Fort Hall Indian Reservation. Phone Pocatello 232-6620, Ext. 322. Can see phosphate open pit mining operation, some fossils, various geologic formations.

CARIBOU COUNTY

J. R. SIMPLOT CONDA MINE AND BENEFICATION MILL, Soda Springs. Phone Pocatello 232-6620, Ext. 298, or write Director of Mining Operations, J. R. Simplot Company, Box 912, Pocatello. Can see open pit phosphate mining operation, beneficiation plant, and various geologic features, also some fossils. Grades 8-12 only.

CARIBOU COUNTY

GRAYS LAKE NATIONAL WILDLIFE REFUGE, Wayan: office 51 West Center Street, Soda Springs. Phone 547-3977. Observation of birds and animals, discussion of succession, development and proposed development, history of National Wildlife Refuges, purpose of a refuge operation and management techniques, effect within area and importance and relationship to economy.

CLARK COUNTY

U. S. SHEEP EXPERIMENT STATION, Dubois. Phone 374-5172. Best suited for vocational agriculture classes. Tour of grounds and explanation of facilities. High school students only. Open for visits during the spring only.

CUSTER COUNTY

STATE FISH HATCHERY, seventeen miles north of Mackay. Phone 588-2219. Can see complete hatchery operations, rainbow and cutthroat trout.

FREMONT COUNTY

SHERWOOD MUSEUM, Henrys Lake (on Highway 287, about 3 miles from the junction with U. S. 191). One of the oldest original buildings on Henrys Lake; provides an insight into some of the history and early wildlife found in the area.

STATE FISH HATCHERY, Henrys Lake (mailing address, Mack's Inn). Phone Island Park 56. This is a spawning station – taking trout eggs from cutthroats for the whole state. Open only during March through August.

WARM RIVER STATE FISH HATCHERY, Ashton. Phone 837-4410. (Located 5 miles east of Upper Mesa Falls.) Can see testing of experimental diets – mainly cutthroat trout. Open May through September.

STATE FISH HATCHERY, Ashton. (Five miles west) Phone 652-3579. Can see complete hatchery operations; rainbow, cutthroat, brook, brown and kokanee.

JEFFERSON COUNTY

CAMAS NATIONAL WILDLIFE REFUGE, Hamer. Phone 662-5425. Observation of waterfowl, antelope, deer and birds. Banding operations during August and September.

MARKET LAKE WILDLIFE MANAGEMENT AREA, Contact Resident Manager, Route 1, Roberts. Phone 228-3226. One of the best publicly-owned waterfowl areas in the state. Can see spectacular flights on waterfowl here in spring and fall.

LEMHI COUNTY

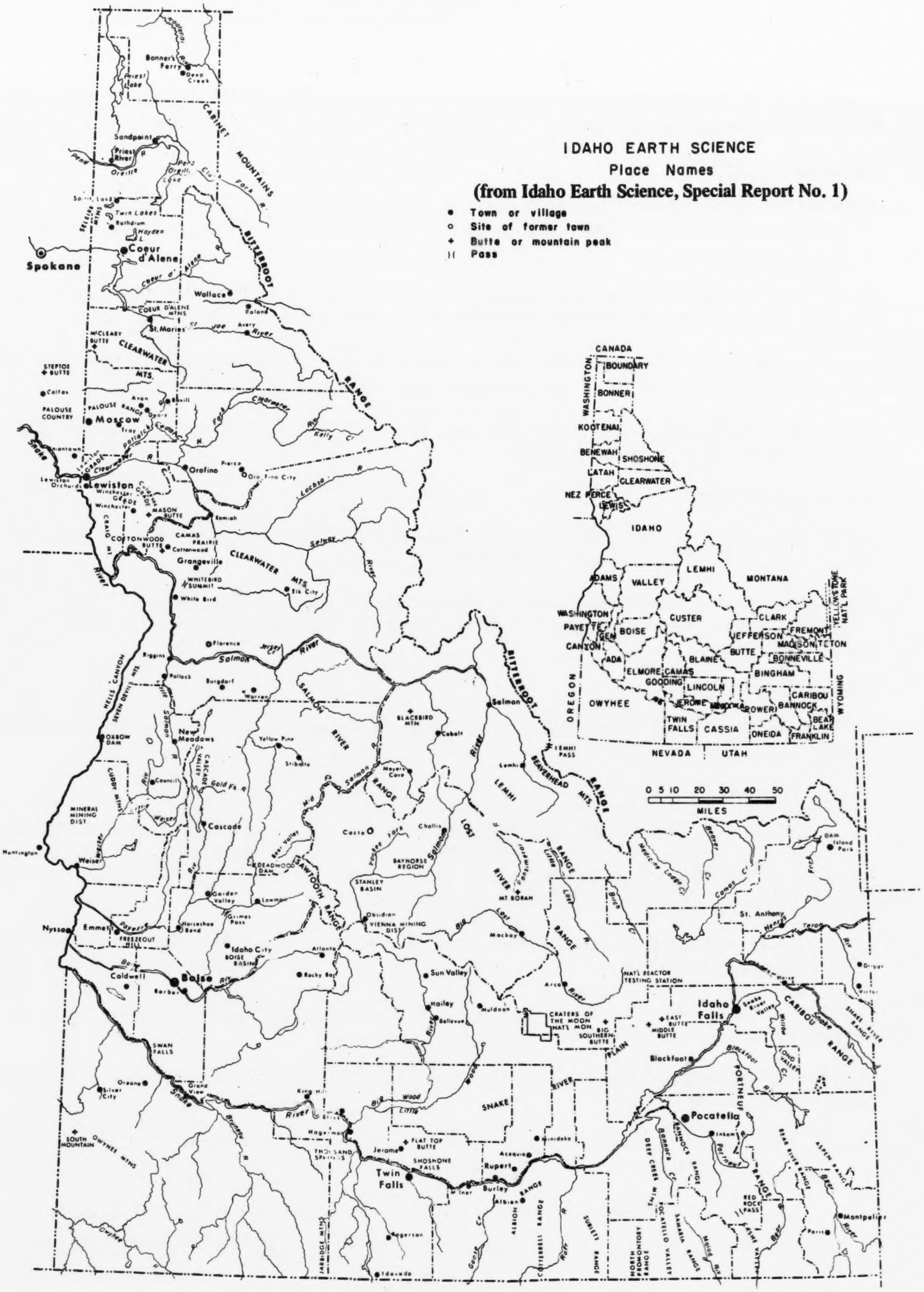
LEMHI COUNTY MUSEUM, Salmon. Maintained by the Lemhi Historical Society; reveals early history of Lemhi County.

MADISON COUNTY

RICKS COLLEGE OBSERVATORY AND PLANETARIUM, Rexburg. Phone 356-5452, Prof. Gordon Dixon. Observatory: viewing of the moon should be done between 1st crescent and gibbous phase. Deep sky observation during dark of the moon. Admission: students 10c; Adults 25c; Minimum $5.00. Planetarium: Talks and slides on "Stars and Galaxies," "Moon Trip," "The Stonehenge," and others.

CRYSTAL ICE CAVES, eighteen miles due west of Aberdeen. Contact James L. Papadakis, American Falls. Phone American Falls 226-2650. On the road to the caves one can see irrigated and dry-land farms and sagebrush country of the Snake River Plain; at the caves, surface volcanic features, lava flows, King's Bowl; the Great Rift and the Crystal Ice Caves have been declared national landmarks. Open May 1 to November 1; will take any size group. Booklets, postcards, and slides are on sale at the cave.

STATE FISH HATCHERY, American Falls. Phone 226-2015. Rainbow, cutthroat, and brook trout. Complete hatchery operations.



IDAHO EARTH SCIENCE

Place Names

(from Idaho Earth Science, Special Report No. 1)

- ● Town or village
- ○ Site of former town
- + Butte or mountain peak
-)(Pass

Bonner's Ferry
Deep Creek
Priest Lake
CABINET MOUNTAINS
Sandpoint
Priest River
Pend Oreille
Pend Oreille Lake
Clark Fork R.
Spirit Lake
SELKIRK MTNS
Twin Lakes
Rathdrum
Hayden L
BITTERROOT
Spokane
Coeur d'Alene
Wallace
Roland
COEUR D'ALENE MTNS
St. Maries
St. Joe River
Avery
McCLEARY BUTTE
CLEARWATER MTS.
STEPTOE BUTTE
Colfax
PALOUSE COUNTRY
PALOUSE RANGE
Avon
Bovill
Moscow
Troy
Potlatch
Kelly Cr
RANGE
Orofino
Pierce
Oro Fino City
Lochsa R
Lewiston Orchards
Lewiston
Winchester
Winchester
CRAIG MT
MASON BUTTE
Kamiah
COTTONWOOD BUTTE
CAMAS PRAIRIE
Cottonwood
Selway
Grangeville
CLEARWATER MTS.
WHITEBIRD SUMMIT
Elk City
White Bird
Florence
Salmon River
Riggins
Pollock
Burgdorf
Warren
HELLS CANYON
SEVEN DEVILS MTS.
SALMON RIVER
BLACKBIRD MTN
Salmon
Cobalt
OXBOW DAM
New Meadows
Yellow Pine
Stibnite
Lemhi Pass
Leadore
Meyers Cove
RANGE
BEAVERHEAD MTS.
Council
Gold Fk R
LEMHI
CUDDY MTNS
MINERAL MINING DIST
Cascade
Casto
Challis
LOST RIVER
RANGE
Huntington
Weiser
DEADWOOD DAM
SAWTOOTH RANGE
BAYHORSE REGION
STANLEY BASIN
Garden Valley
Lowman
MT BORAH
Grimes Pass
Obsidian
VIENNA MINING DIST
Nyssa
Emmett
Horseshoe Bend
FREEZEOUT HILL
Idaho City
BOISE BASIN
Atlanta
Mackay
Caldwell
Boise
Barber
Rocky Bar
Sun Valley
Hailey
Bellevue
Muldoon
Arco
NAT'L REACTOR TESTING STATION
CRATERS OF THE MOON NAT'L MON
BIG SOUTHERN BUTTE
EAST BUTTE
MIDDLE BUTTE
SWAN FALLS
Oreana
Silver City
Grand View
King Hill
SNAKE RIVER PLAIN
Idaho Falls
Blackfoot
Pocatello
Inkom
St. Anthony
Island Park
Driggs
Victor
CARIBOU RANGE
SNAKE RIVER RANGE
SOUTH MOUNTAIN
OWYHEE MTNS
Hagerman
Bliss
THOUSAND SPRINGS
Jerome
FLAT TOP BUTTE
SHOSHONE FALLS
Minidoka
Acequia
Rupert
Burley
Twin Falls
Milner
ALBION RANGE
Albion
Rogerson
Idavada
JARBIDGE MTNS
COTTERELL RANGE
SUBLETT RANGE
NORTH PROMONTORY RANGE
DEEP CREEK MTNS
BANNOCK RANGE
POCATELLO VALLEY
SAMARIA RANGE
RED ROCK PASS
MALAD RANGE
Preston
Paris
Montpelier
Bear River
ASPEN RANGE
PORTNEUF RANGE
CANADA
WASHINGTON
BOUNDARY
BONNER
KOOTENAI
BENEWAH
SHOSHONE
LATAH
CLEARWATER
NEZ PERCE
LEWIS
IDAHO
LEMHI
MONTANA
ADAMS
VALLEY
WASHINGTON
PAYETTE
GEM
BOISE
CUSTER
CLARK
FREMONT
JEFFERSON
MADISON
TETON
CANYON
BUTTE
BONNEVILLE
ADA
BLAINE
ELMORE
CAMAS
BINGHAM
GOODING
LINCOLN
CARIBOU
OREGON
OWYHEE
JEROME
MINIDOKA
POWER
BANNOCK
TWIN FALLS
CASSIA
ONEIDA
FRANKLIN
BEAR LAKE
WYOMING
YELLOWSTONE NAT'L PARK
NEVADA
UTAH
0 5 10 20 30 40 50
MILES

BIBLIOGRAPHY

This is by no means a complete list of all the books which pertain to Idaho's natural resources; however, the following are the references which have been most useful in preparing this publication. Many other pamphlets, annual reports, bulletins, surveys, periodicals and theses which are now out of print or which are not readily available were also consulted. You are encouraged to contact governmental agencies or universities for information about specific topics.

Some of these references in turn have extensive bibliographies that are quite useful. Only those considered to be of general interest to all are included. See individual tour guides for specific references for a particular geographical location or subject.

I. Guides

The Peterson Field Guide Series
Houghton Mifflin Company – $4.95 each

Western Birds
Mammals
Western Reptiles and Amphibians
Rocky Mountain Wildflowers
Rocks and Minerals
Stars and Planets
Animal Tracks

The Golden Nature Guides, Golden Press, New York – $1.00 each

Birds
Fish
Fossils
Gamebirds
Insects
Insect Pests
Mammals
Non-flowering Plants
Pond Life
Reptiles and Amphibians
Rocks and Minerals
Regional Guides: **The Rocky Mountains**
The Pacific Northwest

II. Biology

Baker, et al, **Wildlife of the Northern Rocky Mountains**. Naturegraph Company, Healdsburg, California. c. 1961 (1.95)

Brown et al, **Wildlife of the Intermountain West**. Naturegraph Company, c. 1958 (2.50)

Brown, Vinson, **Backyard Wild Birds of California and the Pacific Northwest**, T. F. H. Publications, Inc., T. F. H. Bldg., 245 Cornelison Ave., Jersey City, N.J. c. 1965 (1.00)

Larrison et al, **Guide to Idaho Birds**, Journal of the Idaho Academy of Science, c. 1967, University of Idaho, Moscow, Idaho (2.00)

Larrison, Earl J., **Guide to Idaho Mammals**, Journal of the Idaho Academy of Science, c. 1967 (2.00)

III. Earth Science

The geology and mineral resources of Idaho are covered in print more completely than any other resource, due to the work and publications of the Idaho Bureau of Mines and Geology and the U.S. Geological Survey. Because some publications are out of print, a complete listing of currently available material is not included here, but may be obtained from the Bureau at Moscow. Although much of the material is necessarily technical, a great deal of it would be of interest to the average teacher, especially the County Reports, which cover about ¼ of the state. Two exceptionally comprehensive publications of special value are listed below:

Idaho Earth Science Guide, Geology, Fossils, Climate, Water and Soil, Sylvia Ross and Carl Savage, No. 1, Earth Science Series, 1967, Idaho Bureau of Mines, Moscow, Idaho. This is an absolute "must" for anyone wishing to learn about Idaho's natural resources, and should be used as a companion to this book. (4.00)

Special Report No. 1: **Mineral and Water Resources of Idaho**, compiled by the U.S.G.S., Idaho Bureau of Mines, Department of Highways and Department of Reclamation. U.S. Printing Office or Idaho Bureau of Mines (1.00)

Other references on Idaho are:

Ekman, Leonard C., **Scenic Geology of the Pacific Northwest**, Binfords & Mort, Portland, Oregon, c. 1962

Rhodenbaugh, Edward F., **Sketches of Idaho Geology**, Caxton Printers, Caldwell, Idaho, c. 1961 (5.95)

Walker, Eugene H., **A Geologic History of the Snake River Country of Idaho**, Idaho Historical Society, Boise, Idaho, 1963 (25¢)

IV. General

Idaho, A Guide in Word and Pictures, Oxford University Press, N.Y., 1950

Idaho Almanac, Syms-York Co., Boise, Idaho, 1963

V. Outdoor Education

The following are only a few of the literally thousands of publications which describe activities to help students learn about their environment, or contain suggestions for planning field trips and outdoor experiences.

Hall, M. Y., **Simple Science Experiments**, Owen Publishing Co., Danville, N.Y. (1.25)

Hillcourt, William, **Field Book of Nature Activities and Conservation**, G.P. Putnam and Sons, New York, 1961 (4.95)

Milliken, Hamer, McDonald, **Field Study Manual**, Burgess Publishing Co., Minneapolis, Minn., c. 1968 (2.50)

Nickelsburg, Janet, **Field Trips: Ecology for youth leaders**, Burgess Publishing Company, c. 1966

VI. Periodicals

Audubon Magazine (7.00 per year) 1130 Fifth Ave., N.Y., N.Y. 10028

National Wildlife and **Ranger Rick** (for elementary children), (6.00 per year), National Wildlife Federation, 1412 16th St. N.W., Washington, D.C., 20036

Science and Children, National Science Teachers Association, 1201 16th St. N.W., Washington, D.C. (special publication for elementary teachers, 5.00 per year with membership)

INDEX

Albeni Falls . . . 27, 28, 29, 30
Aldape Summit . . . 122 - 125
Aller, Dr. Alvin . . . 50
American Falls School District 381 . . . 14
Anderson Ranch Dam . . . 132, 133
Ashton . . . 164, 167
Athol . . . 28, 29
Atlanta . . . 132
Bannock Peak . . . 181
Barber . . . 135
Basalt . . . 60, 129, 132, 137
179, 187, 188
  ,pillow . . . 147, 199
Bass Pond . . . 83 - 92
Batholith, Idaho . . . 95, 97, 112, 137
138, 139, 146, 151
  ,Kaniksu . . . 22, 27, 35
Bear River . . . 198
Beauty Bay . . . 41
Beauty Creek . . . 41
Beckert, Wilhelm . . . 10
Bellevue . . . 134
Benewah Lake . . . 52, 53
Bernard Peak Lookout . . . 38
Big Springs . . . 169
Big Wood River . . . 134
Birds . . . 13, 74-77, 85-92
100, 107, 171
175-178
Blackfoot River . . . 193
Boise . . . 122, 127, 129, 135
  Mountains . . . 97
  National Forest . . . 125, 126, 138, 141
  River . . . 95
Valley . . . 94 - 100
Bonner County . . . 27 - 38
Bonners Ferry . . . 24
Boundary County . . . 22 - 26
Borchardt, Rita . . . 3
Brennan, Dr. Matthew . . . 6, 15
Bruneau . . . 104, 105, 108
  Canyon . . . 108
  Sand Dunes . . . 105 - 107
  State Park . . . 105
Bureau of Land Management . . . 10, 41
Burke Canyon . . . 45
Cabinet Gorge . . . 38
Cabinet Mountains . . . 26, 27, 38
Cache National Forest . . . 197
Calamity Point . . . 8, 9
Caldera . . . 101, 163, 165, 167
Caldwell . . . 94
Caldwell, Dr. Harry . . . 3
Camas National Wildlife Refuge . . . 171
Camas Prarie . . . 55, 60, 132
Canyon Hill . . . 94
Cassia City of Rocks . . . 150, 151
Cat Creek Summit . . . 132
Caribou City . . . 8, 9
Caribou National Forest . . . 7, 8, 9, 180
189 - 190, 191, 193
Cataldo Mission . . . 43
Caves . . . 62, 131, 159, 162
163, 199, 205, 207
Central Park . . . 98
Chatcolet Lake . . . 53
Cheatback Basin . . . 197, 198
China Hat . . . 191
Cinder Cone Butte . . . 131
Cirques . . . 120, 121, 194
City of Rocks
  Cassia . . . 150, 151
  Gooding . . . 134, 147
Civil Defense Caves . . . 159, 162
Clark Fork (River) . . . 27, 29, 38, 38
Clearwater River . . . 55, 56
Cleft Fissure . . . 131
Cocalalla Lake . . . 28, 35
Coeur d'Alene . . . 39
  Lake . . . 39, 52
  National Forest . . . 39
  Mining District . . . 43
  River . . . 44
Collecting . . . 6, 7
Columbia River Basalt . . . 60
Conda . . . 191
Continental Divide . . . 169
Cottonwood Creek . . . 124
Crag Lake . . . 195
Craig Mountain . . . 56
Crater Rings . . . 131
Craters of the Moon . . . 10
Crosthwaite, E. G. . . . 146
Crystal Ice Caves . . . 159, 162, 163
Cuban Hill Demonstration Area . . . 28, 30, 31
Danskin Canyon . . . 132
Deep Creek . . . 26
Deer Creek Peak . . . 181
Deer Flat National Wildlife Refuge . . . 100
Devil's Corral . . . 150
Dubois, Denis . . . 14
Eagle . . . 99, 142
Edwards, Vella . . . 3
Elsensohn, Sister Alfreda . . . 60

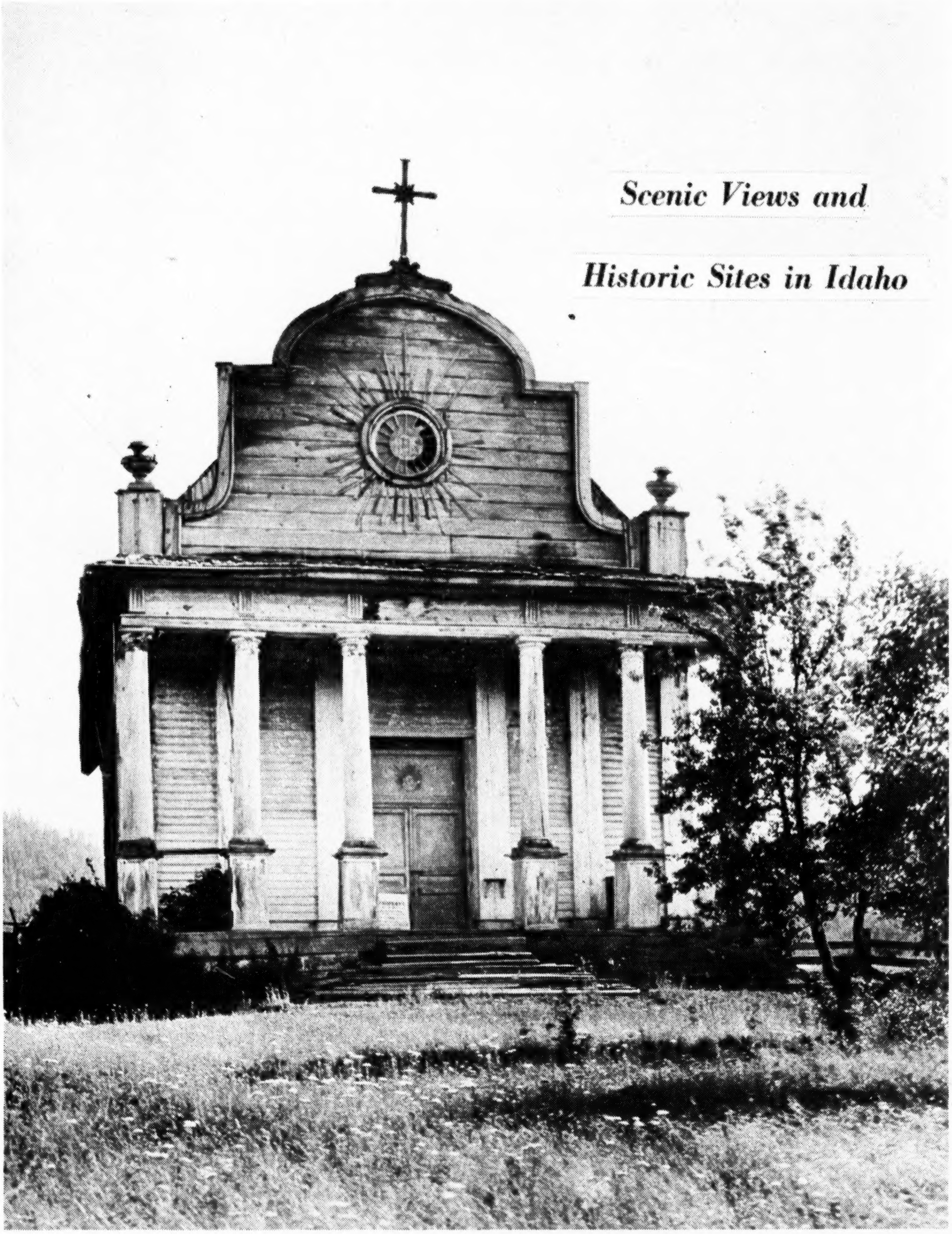
Emmett ... 128
Fairfield ... 129 - 132
David Faith ... 14
Farragut State Park ... 28, 29, 38
Fall Creek ... 8, 9, 62
Falls River ... 164
Faults ... 43, 79, 80, 128
131, 146, 158, 174, 191
Featherville ... 132
Fernan Lake ... 40
Fish Hatcheries ... 44, 62, 147, 167
202, 204 - 207
Flood Control ... 24, 37, 39
46, 50, 124
Ford, Dr. Gilbert ... 204
Formation Springs ... 191
Fort Lemhi ... 174
Fossil Canyon ... 201
Fossils ... 56, 109, 11, 112, 127
135, 139 - 141, 147, 175
180, 194, 199, 201
Fritz, Paul ... 10
Fungi ... 114 - 118
Garnets ... 61
Gem State Grotto
National Speleological Society ... 62
Geyser ... 191, 192
Gilmore ... 173
Givens Springs ... 103
Glacial Features ... 22, 25, 27, 30
37, 41, 62,
119 - 121, 173, 194
Gospel Peak ... 62
Gooding City of Rocks ... 134, 147
Grace ... 199
Granite (town of) ... 28, 35
Granite Creek Campground ... 28, 33
Granite, eroded (hoodoos) ... 132, 151
Granite Plantation ... 36
Grays Lake ... 194
Grays Lake National Wildlife Refuge ... 191, 194
Gyde, Kathryn ... 44
Hagerman Valley ... 146
Hailey ... 134
Hanna Flats Scenic Area ... 28, 33
Hawkins Basin ... 179
Hayden Lake ... 29, 39
Hedlund, Emery ... 53
Hells Canyon ... 67, 78 - 80
Henry's Fork ... 159, 167, 170
Henry's Lake 169
Heyburn State Park ... 52, 53
Higby Cave ... 131
Hill City ... 132
Historical Sites ... 8, 9, 164, 172
174, 175
Hoodoos ... 129, 130
Hope Fault ... 36
Horseshoe Bend ... 127
Hyndman Peak ... 134
Idaho Batholith ... 95, 97, 112, 137
138, 139, 146, 151
Idaho Bureau of Mines & Geology ... 11, 210
Idaho City ... 140
Idaho County ... 57 - 62
Idaho Dept. of Parks ... 10
See State Parks
Idaho Earth Science ... 11, 79, 210
Idaho Fish & Game Dept. ... 6, 26, 39, 62
171, 202, 203, 205, 207
Idaho Highway Dept. ... 6
Indian Bathtub (hot springs) ... 109
Indian Caves ... 132, 143
Indian Creek ... 129
Indian Missions Bonners Ferry ... 23
St. Joseph's ... 56
Indian pictographs ... 102, 103, 109, 132
Inkom ... 187
Island Park Caldera ... 163, 165, 167
Kaniksu Batholith ... 22, 27, 35
Kaniksu National Forest ... 22, 26, 27
28, 31, 38
Kaney, K. A. ... 7
Kay, Richard ... 3, 14
Keenan City ... 8, 9
Kellogg ... 45
Kootenai County ... 34
Kootenai National Game Refuge ... 24
Kootenai River ... 22
Laclede ... 28, 34
Lake Bonneville ... 110, 112, 147, 150
171, 179, 187
Lake Lowell ... 100, 137
Lakes
Benewah ... 52, 53
Chatcolet ... 53
Cocalalla ... 28, 35
Coeur d'Alene ... 39, 52
Crag ... 195
Fernan ... 40
Grays ... 194
Hayden ... 29, 39
Henrys ... 169
Lowell ... 100, 137

  - Market . . . 171, 172
  - Mud . . . 171, 172
  - Pend Oreille . . . 28, 34, 38
  - Priest . . . 28, 33
  - Spirit . . . 29
  - Swan . . . 168, 201
- Lander Trail . . . 8, 9, 151, 193
- Landslides . . . 127
- Lawrence Mine . . . 37
- Leadore . . . 174
- Leaves . . . 16
- Leonia . . . 26
- Lewis County . . . 5, 4, 57
- Lewiston . . . 54
- Lick Creek . . . 121
- Lightning Creek . . . 37
- Limestone . . . 79, 109, 180
- Lindsay, Delbert W. . . . 159, 163, 170
- Lingenfelter, R. L. . . . 10
- Littlejohn, Barbara . . . 67, 83
- Little Salmon River . . . 62
- Lizard Butte . . . 104
- Lower Mesa Falls . . . 165, 166
- Luby Bay . . . 28, 32
- Lucky Peak Dam . . . 137
  - State Park . . . 137
- Luke, A. D. . . . 3
- Malad Gorge . . . 146, 147
  - River . . . 147
- Mammals . . . 13, 78
- Maps . . . 6, 54
- Market Lake Wildlife Area . . . 171, 172
- Mayfield . . . 129, 130
- McCall . . . 119 - 121
- Melon Gravels . . . 110, 150
- Menan Buttes . . . 154 - 158, 170
- Mercury Mine (Idaho Almaden) . . . 93
- Mesa Falls . . . 165
- Mickelson, Hal . . . 7
- Middleton . . . 98
- Mineral Ridge . . . 40, 41
- Mines . . . 143, 144, 195, 203, 206
  - Beauty Creek . . . 41, 42
  - Bunker Hill . . . 43
  - Hecla . . . 43
  - Lakeview Area . . . 38
  - Lawrence . . . 37
  - Mercury . . . 93
  - Nicholia . . . 173
  - Sunshine . . . 43
  - Triumph . . . 134
  - Whitedelph . . . 37
  - Wood Rat . . . 28, 33
- Mink Creek . . . 179, 180, 189 - 190
- Mission Point . . . 52
- Molsee, Carol . . . 11
- Mountain Home . . . 129, 131
- Mountains
  - Boise . . . 97
  - Cabinet . . . 26, 27, 38
  - Selkirk . . . 22, 25, 27, 38
- Moyie River . . . 24
- Mud Lake . . . 171, 172
- Mullan Road . . . 43
- Murray . . . 45
- Museums . . . 206, 207
- Mushrooms . . . 114 - 118
- Nampa . . . 100
- Naples . . . 26
- National Forests . . . 202 -204
  - Cache . . . 197
  - Caribou . . . 7, 8, 9, 180 - 190 191, 193
  - Coeur d'Alene . . . 39
  - Kaniksu . . . 22, 26, 27, 28, 31, 38
  - Nez Perce . . . 58 - 60
  - Payette . . . 119
  - St. Joe . . . 54
  - Targhee . . . 164
- National Wildlife Refuges . . . 202 - 207
  - Camas . . . 171
  - Deer Flat . . . 100
  - Grays Lake . . . 191, 194
  - Kootenai . . . 24
- Nez Perce County . . . 54 - 57
  - National Historical Park . . . 55, 56
  - Forest . . . 58 - 60
  - Indians . . . 60
- Niagra Springs . . . 150
- Norseen, Nancy . . . 3, 67, 83
- Northwest Nazarene College . . . 204
- Nutmeg Mountain . . . 93
- Oakley . . . 150
- Observatories . . . 204, 207
- Oneida Salt Works . . . 8, 9
- Oregon Trail . . . 96, 131, 137
- Ospreys . . . 28, 35, 53
- Owyhee County . . . 104 - 118
- Owyhee Historical Society . . . 104
- Oxbow Lake . . . 99, 191
- Packard, Dr. Patricia . . . 3, 94, 135
- Palisade Wildlife Area . . . 8, 9
- Papadakis, James L. . . . 207
- Payette Lakes . . . 119

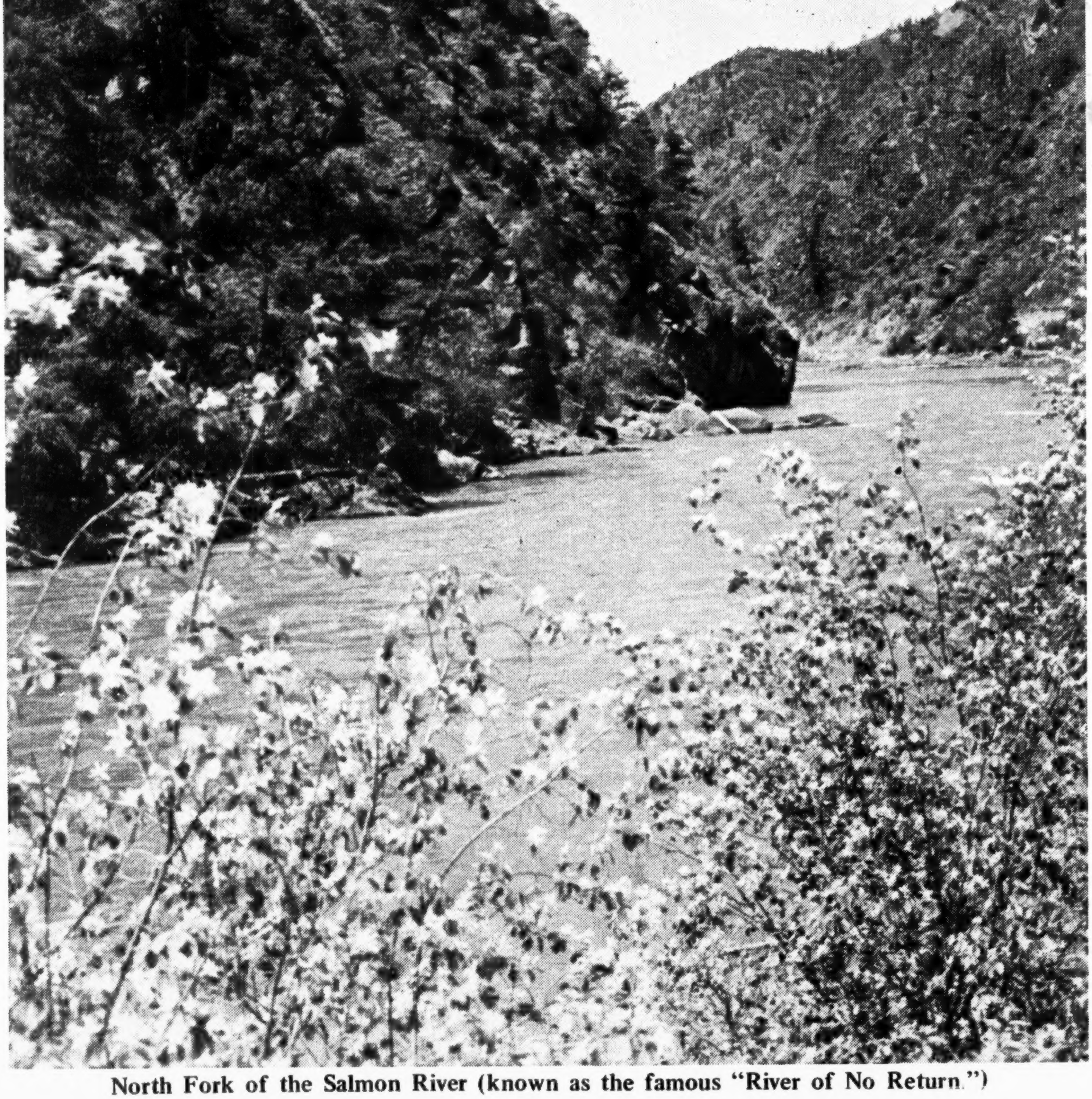
  National Forest ... 119 - 121
Pearl ... 142 - 146
Pend Oreille Lake ... 28, 34, 38
Pend Oreille River ... 27, 29
Phosphoria Formation ... 193
Phosphorus Plant ... 191
Pillow Basalt ... 147, 199
Pocatello ... 179, 189
Pond ... 17
Portneuf River ... 179
Post Falls ... 41
Prichard ... 45
Priest Lake ... 28, 33
Priest River ... 27, 28, 30, 31
Priest River Experimental Forest ... 28, 30
Preston ... 199
Program of Outdoor Education ... 2, 14
Purcell Trench ... 22, 27, 38
Quartzite Mine ... 195
Rathdrum Prairie ... 28, 29, 38, 41
Red Rock Canyon ... 143
Reeves, Ralph ... 191
Rexburg ... 154, 158, 163
Reynolds Creek ... 112
  Watershed Research ... 112, 113
Reynolds, Dorothy ... 3, 129
Rhyolite ... 112, 124, 131
143, 165, 191
Ricks College ... 207
Riggins ... 60
Riggins Hot Springs ... 61
Rivers
  Bear ... 198
  Big Wood ... 134
  Blackfoot ... 193
  Boise ... 95
  Clark Fork ... 27, 29, 37, 38
  Clearwater ... 55, 56
  Coeur d'Alene ... 44
  Falls ... 164
  Henrys Fork ... 159, 167, 170
  Kootenai ... 22
  Little Salmon ... 62
  Malad ... 147
  Moyie ... 24
  Pend Oreille ... 27, 29
  Portneuf ... 179
  Priest ... 27, 28, 30, 31
  Salmon ... 56
  Snake ... 67, 102, 103, 154
158, 163, 170
  St. Joe ... 46 - 54
  St. Maries ... 48
  Teton ... 159
Roberts ... 172
Robie Creek ... 122 - 126
Rocky Bar ... 132
Rock Canyon ... 143
Rocky Canyon ... 122 - 125
Ross, Sylvia ... 3, 11, 210
Round Lake State Park ... 28, 35
Salmon River ... 56
Sand Dunes ... 105 - 107, 159 - 161
Sandpoint ... 28, 34, 36
Savage, Carl ... 11
Schoolground Tours ... 6, 15
Selkirk Mountains ... 22, 25, 27, 38
Sequoia ... 123
Seven Devils Volcanics ... 60
Shimada, Harry ... 14
Shoshone Falls ... 150
Skabelund, Paul ... 119
Smith, Dr. Alexander ... 32, 117, 118
Snake River ... 67, 102, 103
154, 158, 163, 170
Snake River Canyon ... 67 - 81
Soda Point ... 198
Soda Springs ... 191 - 201
Soderblom, Jon ... 10
Spalding Mission ... 55, 56
Spirit Lake ... 29
Squaw Butte ... 97
Squaw Meadows ... 120
St. Anthony ... 164
St. Joe Baldy ... 48
  City ... 48, 52
  River ... 46 - 54
  National Forest ... 54
St. Maries ... 46, 47, 48
  River ... 48
Stanford, Dr. Lyle ... 3
State Forests ... 10
State Land Department ... 6
State Parks
  Bruneau ... 105
  Farragut ... 28, 29, 38
  Heyburn ... 52, 53
  Lucky Peak ... 137
  Malad Gorge ... 146
  Round Lake ... 28, 35
  Winchester ... 57
Sulphur Canyon ... 200
Swan Lake ... 168, 201
Tablerock ... 99, 135

Targhee National Forest 164
Terraces 95, 129, 135, 185
Teton Range 154, 156, 164
  River 159
Thornton, Jerry 62
Thousand Springs 147
Travertine 8, 9, 191, 199, 201
Trees 12, 13, 15, 25, 68
Trestle Creek 36
Triumph Mine 134
Trout Farms 205
Trueblood, Ellen 114
  Ted 114
Tubbs Hill 39
Twin Falls .... 146 - 150
U. S. Forest Service 7
  (See National Forests)
U. S. Geological Survey 6
U. S. Wildlife Refuges 10
  (See National Wildlife Refuges)
Upper Mesa Falls 165
Vegetation Zones .... 11, 50, 68 - 73, 122
Walker, Dr. Eugene 30
Wallace 45
Walters Ferry .... 109 - 110
Warm River 164, 165
Warner, Dr. Mont 127
Warren Wagon Road 119, 120
Waterfall Ice Cave 162
Watershed Projects
  Tom's Gulch 38
  Reynolds Creek 112, 113
Wayan 194
Weiser 83, 93
Wildflowers .... 25, 32, 52, 70 - 73
Williams, Edmund J. 154, 159, 163, 170
Willow Creek .... 97, 142 - 146
Winchester State Park 57
Wood Rat Mine 28, 33

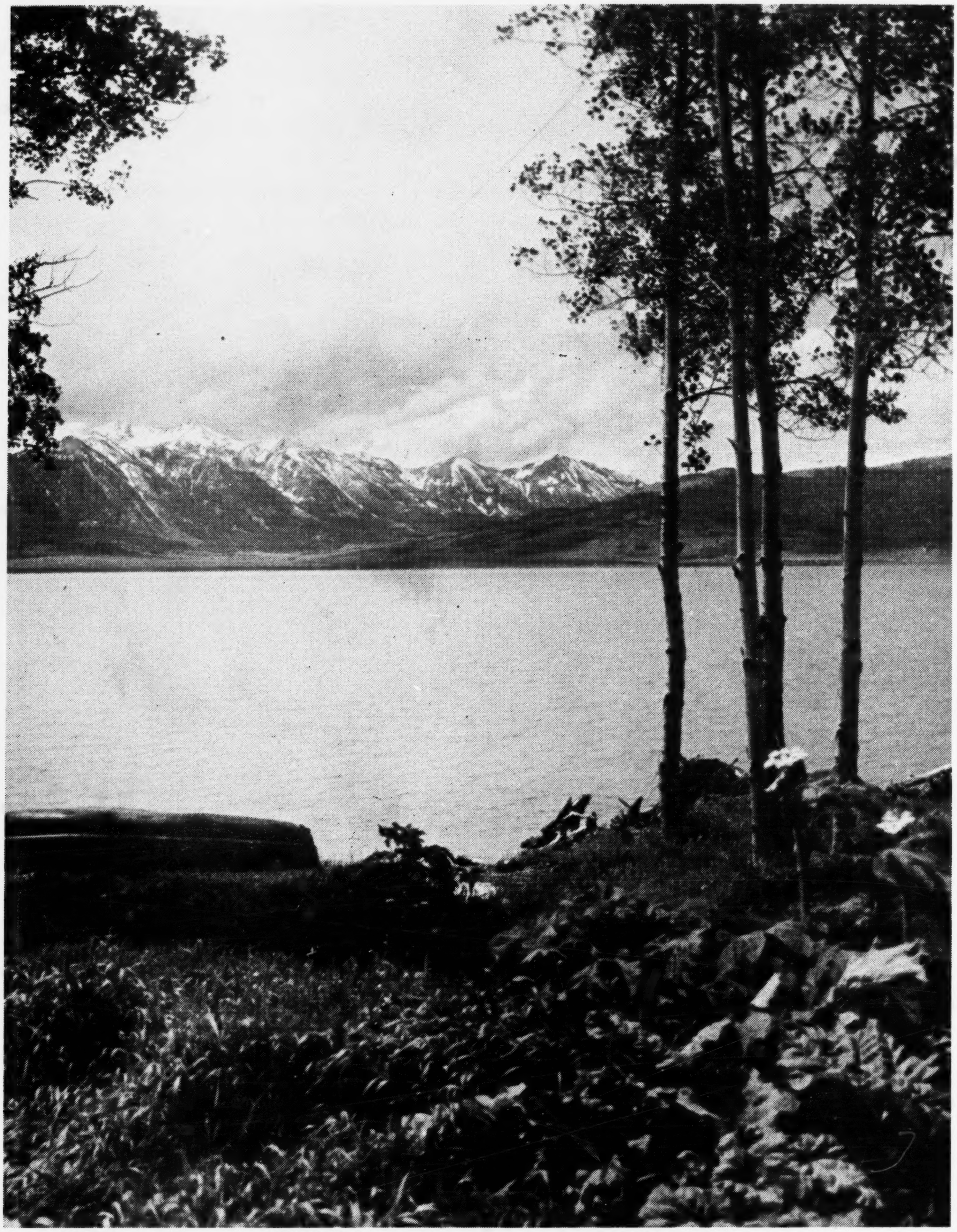
Scenic Views and Historic Sites in Idaho



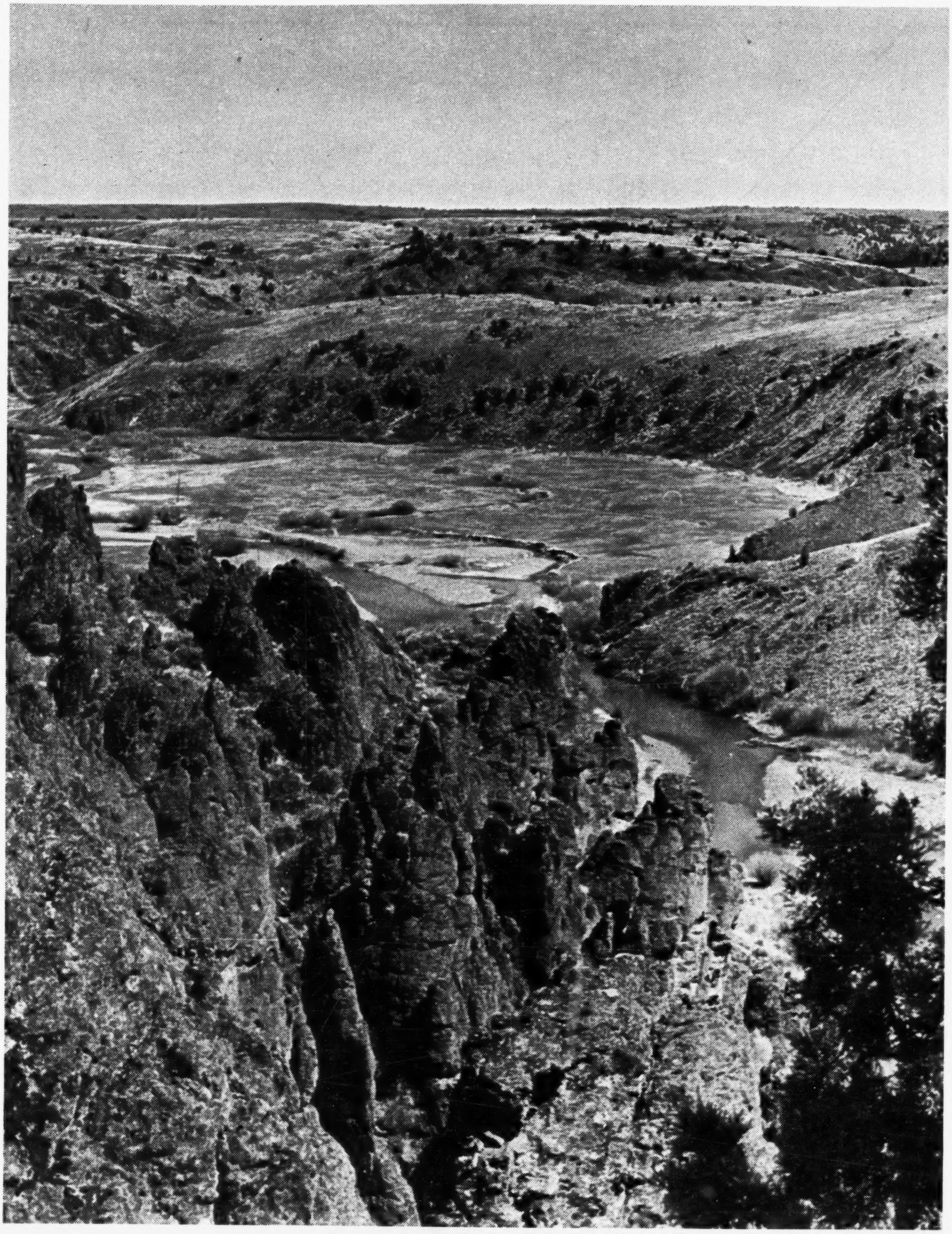
Cataldo Mission – Coeur d'Alene River



North Fork of the Salmon River (known as the famous "River of No Return.")

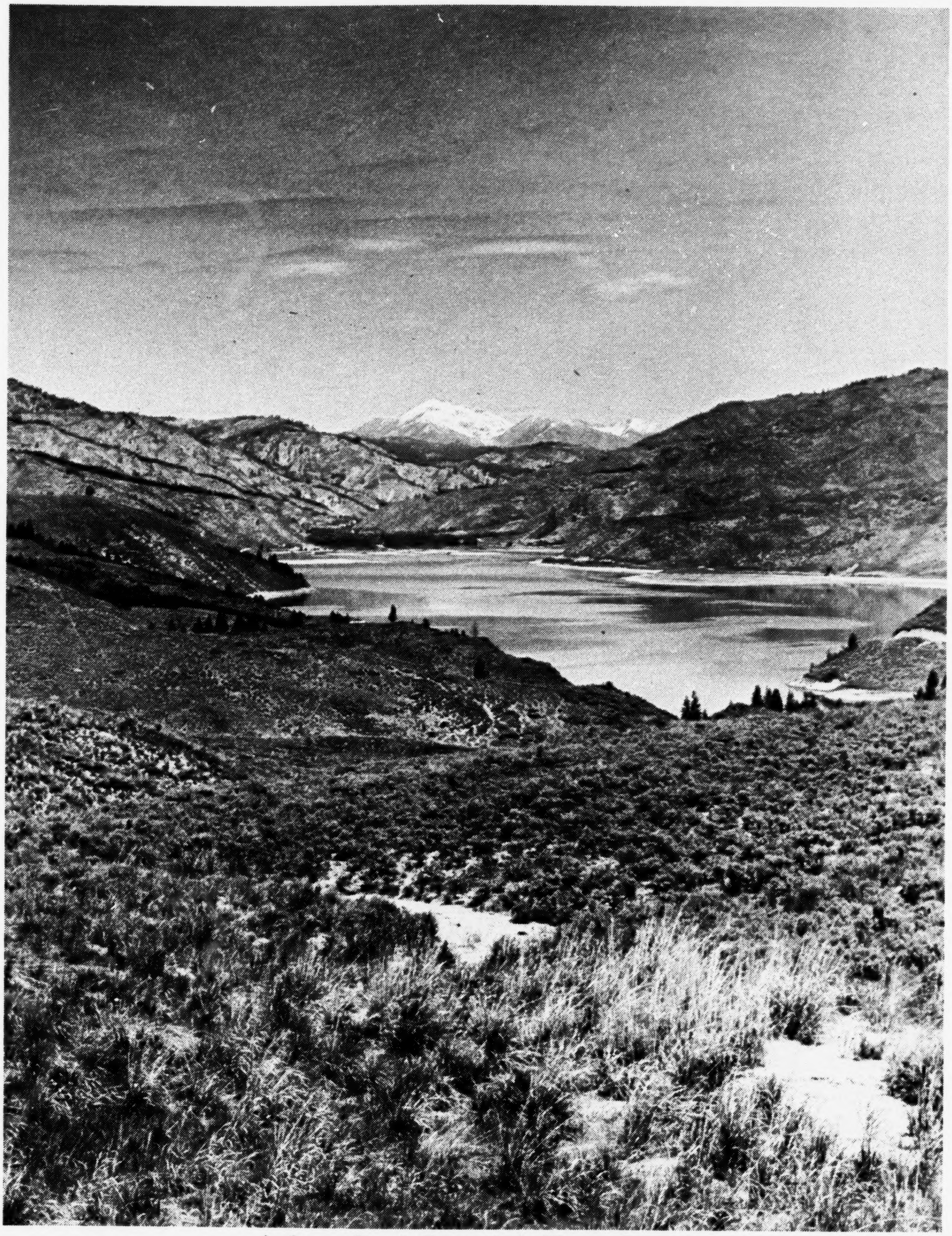


Henry's Lake, located within 15 miles of Yellowstone National Park

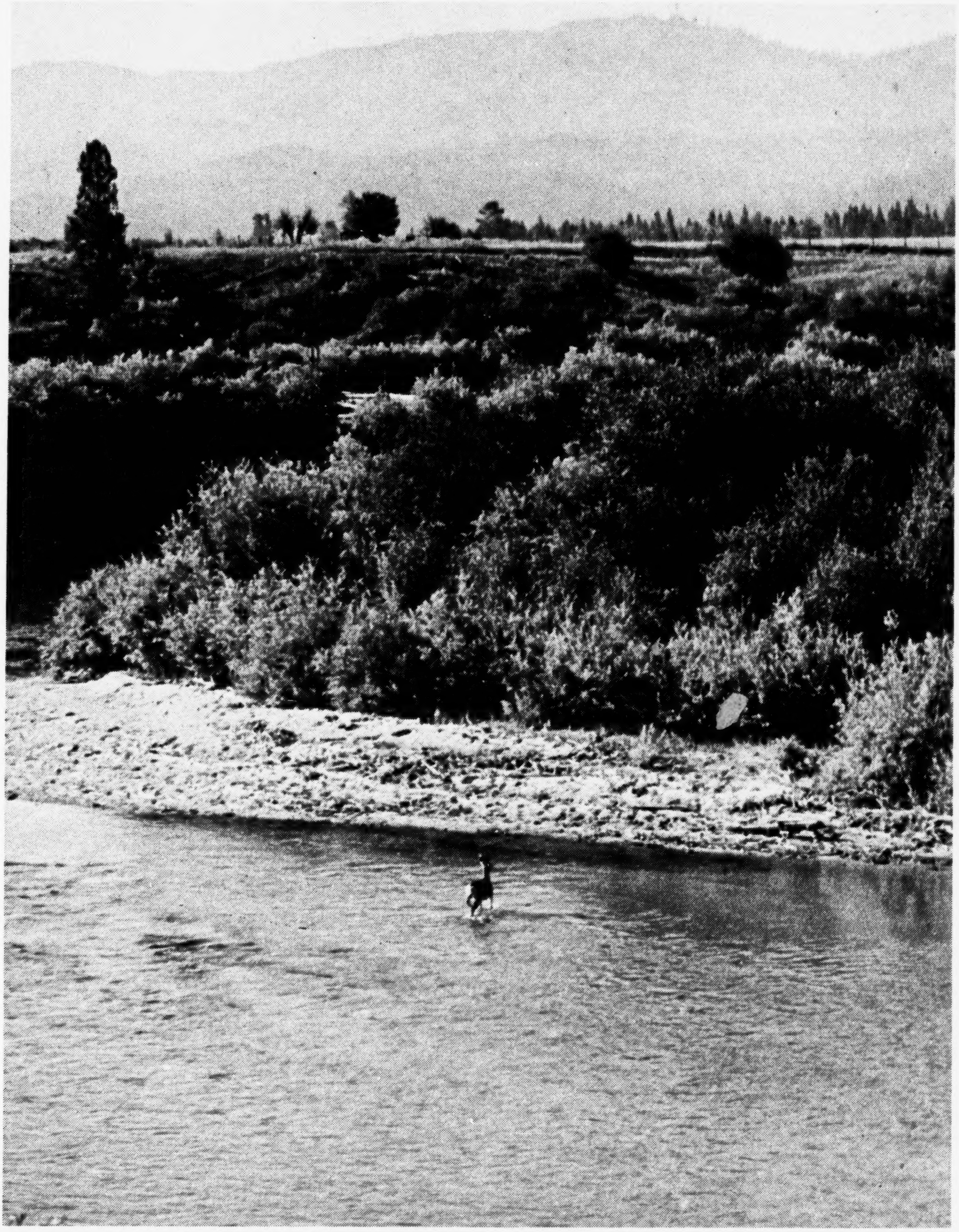


Jordan Creek in Owyhee County

Snake River near Melba



Anderson Ranch Reservoir in Elmore County



Deer crossing river near Crouch